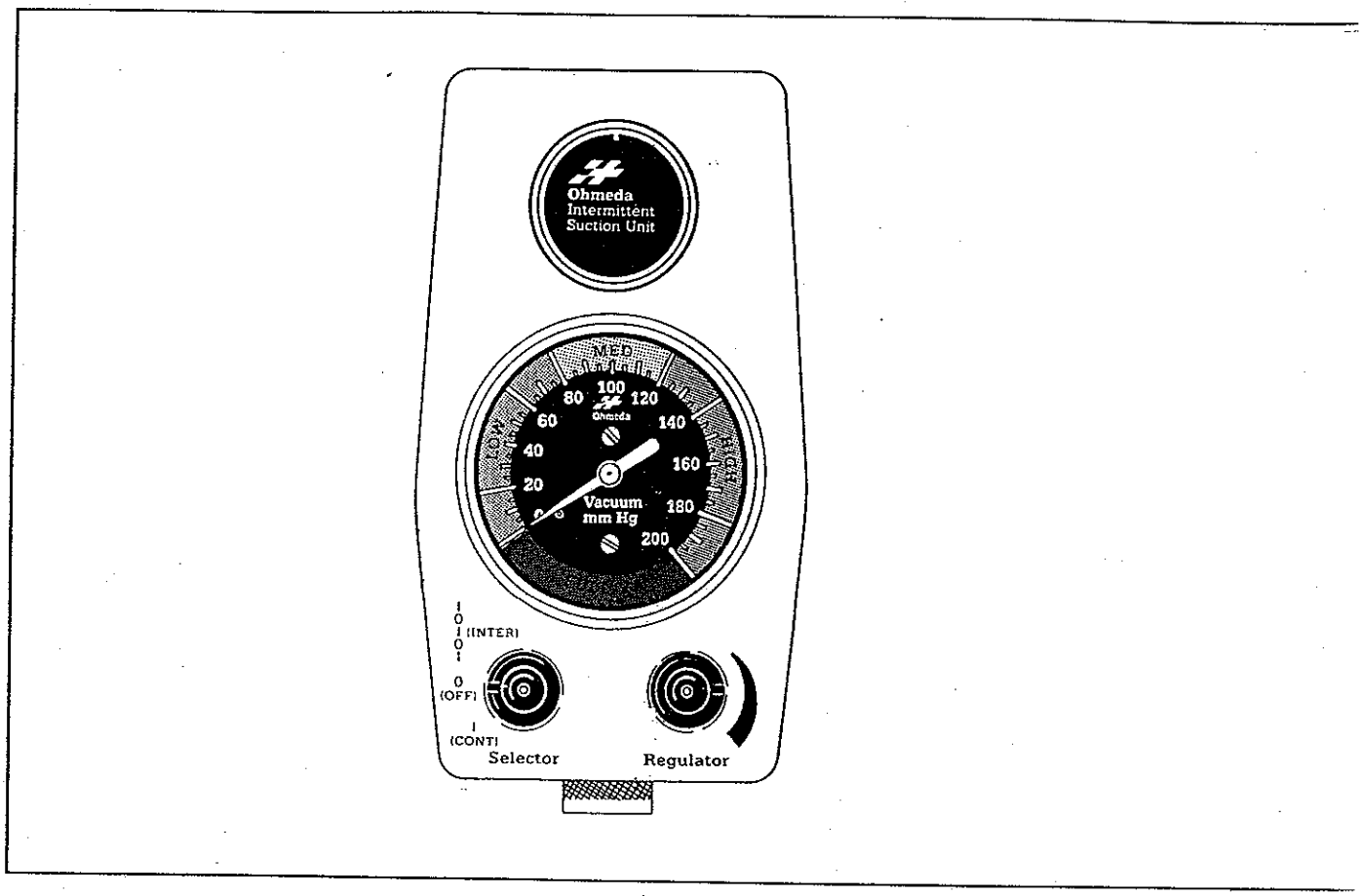
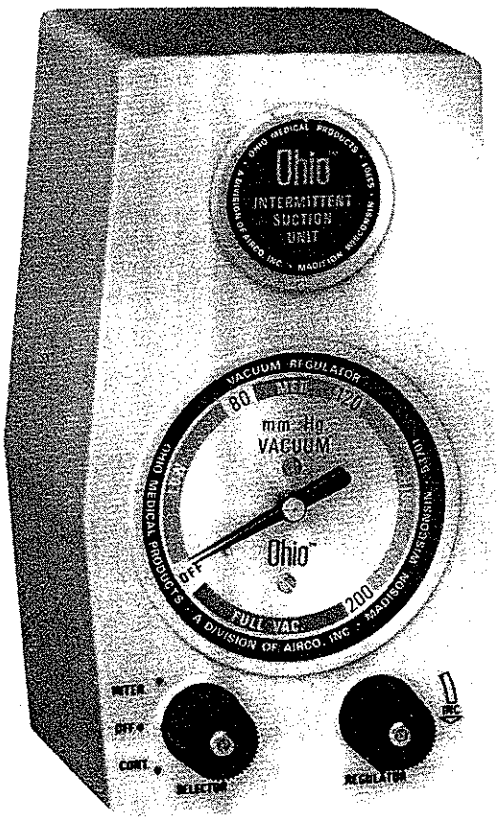
Intermittent Suction Unit
Operation and Maintenance Manual



Intermittent Suction Unit (ISU)
Service Manual



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Introduction

This section includes service and parts information for the Ohmeda Intermittent Suction Unit (ISU).

Technical Competence

The procedures described in this service manual should be performed by trained and authorized personnel only. Maintenance should only be undertaken by competent individuals who have a general knowledge of and experience with devices of this nature.

Genuine replacement parts manufactured or sold by Ohmeda must be used for all repairs.

Read completely through each step in every procedure before starting the procedure; any exceptions may result in a failure to properly and safely complete the attempted procedure.

Precautions

Cautions

Prior to placing the unit back into service, after disassembly or cleaning, perform the checkout procedure.

Steam autoclaving or liquid sterilization of this regulator should be avoided, as damage to the unit may occur. The only acceptable method of sterilization for this unit is gas (ethylene-oxide).

Parts that have been sterilized with ethylene-oxide must be quarantined in a well ventilated area to allow dissipation of residual ethylene-oxide absorbed by the material. In some cases, quarantine periods of seven days or more may be required. Follow the recommendations of the sterilizer manufacturer for the specific aeration periods required.

When installing the ISU cover screws into the plastic cover, use care to get them started straight and use only moderate torque for tightening to prevent stripping the threads.

Warning

If the unit has failed any part of the checkout procedure, it must be removed from service and repaired.

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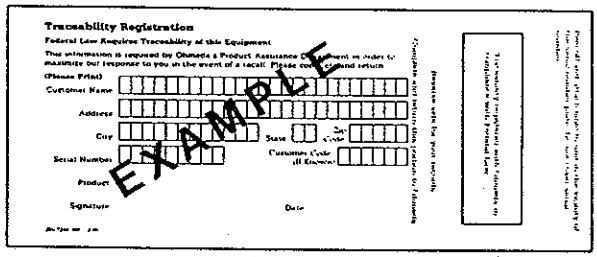
User Responsibility

This Product will perform in conformity with the description thereof contained in this operation manual and accompanying labels and/or inserts, when assembled, operated, maintained and repaired in accordance with the instructions provided. This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated, should be replaced immediately. Should such repair or replacement become necessary, Ohmeda recommends that a telephonic or written request for service advice be made to the nearest Ohmeda Regional Service Office. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Ohmeda, or altered without the prior written approval of Ohmeda's Safety Department. The user of this Product shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, improper repair, damage, or alterations by anyone other than Ohmeda.

CAUTION: Federal law in U.S.A. and Canada restricts this device to sale by or on the order of a licensed medical practitioner.

Traceability: Federal law in the U.S.A. requires traceability of this equipment. Please fill out the self-addressed traceability registration card included with this product and return it to Ohmeda. If additional cards are required, order Stock Number 6700-0025-100.



Definitions

Note:

A Note provides additional information to clarify a point in the text.

Important:

An Important statement is similar to a Note but used for greater emphasis.

CAUTION:

A CAUTION statement is used when the possibility of damage to the equipment exists.

WARNING:

A WARNING statement is used when the possibility of injury to the patient or the operator exists.

Precautions

Warnings

Continuous suction on one spot of the stomach mucosal wall may result in the mucosa being aspirated into the catheter eyelets causing ulcerations, hemorrhage or perforation. In addition, when the eyelets are blocked, secreted fluids and gas will not be removed from the stomach and will accumulate in the stomach and/or other areas of the intestinal tract.

The checkout procedure must be performed before using this equipment on a patient. If the regulator fails any part of the checkout procedure, it must be removed from service and repaired by qualified service personnel.

When setting up the gastro-intestinal suction apparatus, be sure there is no draping of the connecting tubing between the collection bottle and the patient, or drainage will be impaired.

If the screws on the timing valves are turned clockwise all the way in, the Intermittent Suction Unit *will not cycle.*

Clean and sterilize all units before shipment to ensure transportation personnel and service personnel are not exposed to any hazardous contamination.

Clean and sterilize all suction equipment before any maintenance to ensure service personnel are not exposed to any hazardous contamination.

Cautions

An Overflow Safety Trap Assembly should be used whenever the Intermittent Suction Unit is used to help prevent exudate from entering the regulator. Most problems with suction regulators are caused by accumulations of exudate in the regulator. The use of the overflow safety trap assembly will help prevent this and extend the life of the suction equipment.

The Intermittent Suction Unit should be preset and checked before applying to the patient. Make all vacuum level and timing adjustments first and then connect the Intermittent Suction Unit to the patient. Use the procedure described in Section 2.4 E. to lock the selector knobs in place to prevent unauthorized changes.

Only competent individuals trained in the repair of this equipment should attempt to service it.

Detailed information for more extensive repairs is included in the service manual solely for the convenience of users having proper knowledge, tools and test equipment, and for service representatives trained by Ohmeda.

Do not steam autoclave or liquid sterilize the Intermittent Suction Unit. Severe impairment to the operation of the unit will result. The only acceptable method of sterilization is with gas (ethylene oxide).

Following sterilization with ethylene oxide, parts should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the material. Follow sterilizer manufacturer's recommendations for specific aeration periods required.

Cleanliness is of utmost importance. The Intermittent Suction Unit should be disassembled when cleaning or repairing in as clean an environment as possible. Dirt or debris in any removable part such as the timing and flow control valves can be cleaned out. However, any dirt in the molded plastic base will be impossible to remove and may prevent the Intermittent Suction Unit from operating correctly. In such cases the base should be replaced. To have the base replaced refer to the service manual or contact your nearest Ohmeda Service Center.

The Intermittent Suction Unit will always start in the OFF cycle; so be sure that you wait at least 20 seconds with the outlet of the regulator tube occluded to determine if the regulator is functioning.

1/Description

1.1 General

The Ohmeda Intermittent Suction Unit (ISU) is a dual purpose unit which provides either intermittent or continuous suction.

When used as an intermittent suction unit, both the "ON" and "OFF" time cycles are independently adjustable within a range of 3 to 30 seconds. These are pre-set at the factory to provide approximately 15 seconds "ON" and 8 seconds "OFF." The reason for the "ON" cycle being nearly twice as long as the "OFF" cycle is to assure that the drainage trend is always away from the patient and toward the collection bottle.

The vacuum is completely adjustable through a range of zero to 200 mm Hg (0 to 100 kPa on International Units). Regulated vacuum is also available as a continuous mode of operation. Since only two controls are normally used, simplicity of operation is assured. The ISU contains a hidden locking tool which can be used to lock both the vacuum control knob and the mode control knob at the desired setting. A wide variety of direct-mounting and bracket-mounting configurations are available.

The intermittent mode on the ISU has been set to create maximum vacuum flows of 8 L/min. at any regulator setting from 80 mm Hg to full regulator vacuum. If the ISU is used in the CONTINUOUS MODE, it will produce flows of up to 80 L/min. when set for full regulator vacuum. The reasons for the lower intermittent flow rate are:

1. High flows, while in the "ON" or suctioning portion of the cycle, could be extremely discomforting to the patient due to the speed at which the stomach can be decompressed by the action of the suction.
2. With lower flow rates there is less possibility of occlusion of the tubing, thus allowing for more efficient emptying of the stomach.

1.2 Specifications

1. Factory Pre-set Time Cycles (Intermittent Mode)

   "OFF" Time Cycle 8 seconds ±1.5 seconds

   "ON" Time Cycle 15 seconds ±1.5 seconds

2. Regulated Vacuum Calibrated Range: 0 to 200 mm Hg
   International Units: 0 to 100 KPa

3. Factory Pre-set Flow Rates:

   CONTinuous Mode: in excess of 80 L/min at full increase setting with a vacuum supply of 15 in Hg. or greater
   INTERmittent Mode: 8 L/min. ±1 L/min. (Preset between 80 mm Hg and full regulator vacuum) with a vacuum supply of 15 in Hg. or greater

   Note: Specified flow values are for units without fittings. Fittings will decrease maximum flows. Typical flows with Diamond fittings: 55 L/min in CONTinuous mode.

4. Gauge Accuracy: ±5%
5. Weight: 0.77 kg (1 lb. 11 oz.)
6. Dimensions:
   Height: 16.5 cm (6 5/8 in)
   Width: 8.9 cm (3.5 in)
   Depth: 12.1 cm (4.75 in)

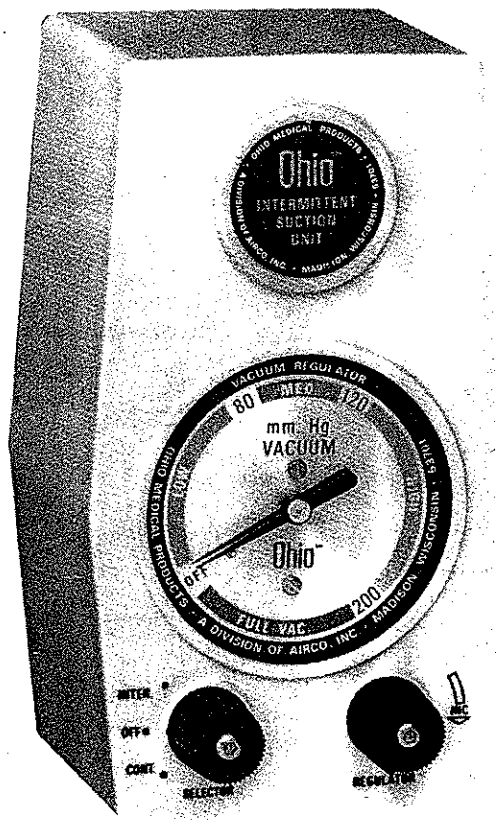


Figure 1
Ohmeda Intermittent Suction Unit (ISU)

2/Functional Description

This unit regulates vacuum in two modes of operation; intermittent and continuous. The continuous mode provides regulated vacuum established by the regulator control. The operation in this mode is the same as described for the Ohmeda Suction Regulator with maximum flow again limited to approximately 80 L/min. The intermittent mode of operation provides regulated vacuum established by the regulator control, but at a preset on and off timing cycle. The intermittent operation is controlled by a unilogic module and the maximum flow is limited to approximately 8 L/min.

Note: This unit has electrical continuity between inlet and outlet connectors.

How the Unilogic Module Works

The heart of the Intermittent Suction Unit is the Unilogic Module which contains four component gates. The component gates are numbered for reference and discussion. The Unilogic Gate is a two state device like an on-off switch. In the example in Figure 2, the common (C) port is connected to the normally-open (N.O.) port, with no vacuum applied to the control port (V). The normally closed port is blocked by the valve as shown.

When a vacuum is applied to the control port labeled V, the Unilogic Gate changes states (see Figure 3). As vacuum is applied to the control port (V), the valve moves over the normally open port and shuts it off. Now the normally closed (NC) port and the common (C) port are connected. Two things to keep in mind are:

1. In the "rest" state, no vacuum is applied to the control port (V).
2. Only a vacuum applied to the control port (V) will cause the Unilogic Gate to change states.

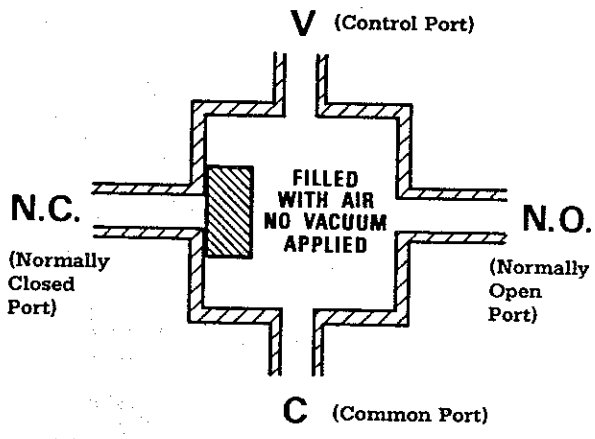


Figure 2
Unilogic Module Gate

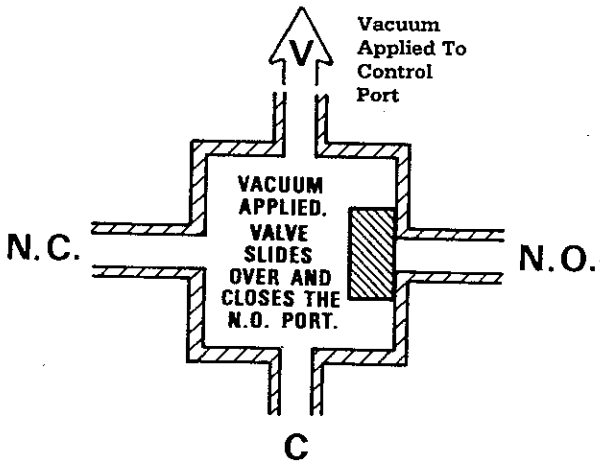


Figure 3
Switched Logic Gate

1/Description

1.1 Introduction

Note: Upon receipt of the Intermittent Suction Unit, inspect the shipping container for visible damage that may have occurred during shipment. If damage to the regulator has occurred, file a damage claim with the shipping carrier immediately.

Thank you for purchasing the Intermittent Suction Unit. Generally speaking, use of intermittent suction is indicated in gastro-intestinal decompression or drainage. Think of the gastro-intestinal tract as a pliable compressible hollow tube. Continuous suction in the tract (typically the stomach) will quickly cause collapse of this hollow tube, resulting in steady suction on one spot of the stomach mucosal wall.

WARNING: Continuous suction on one spot of the stomach mucosal wall may result in the mucosa being aspirated into the catheter eyelets causing ulcerations, hemorrhage or perforation. In addition, when the eyelets are blocked, secreted fluids and gas will not be removed from the stomach and will accumulate in the stomach and/or other areas of the intestinal tract.

Consequently, it is important that truly intermittent suction be used. Truly intermittent suction occurs only when the regulator vents to atmosphere during the off cycle allowing the vacuum in the patient line to deplete back to atmospheric pressure. Only if the suction is truly intermittent can the aspirated fluids in the nasogastric tube run back into the stomach with each "OFF" cycle. This produces a hydraulic back flow through the tube tip that tends to move it away from the stomach lining and relocate it slightly for the next "ON" cycle. Also, if the tip should become clogged with mucus or solids, the hydraulic action of the "OFF" cycle will tend to clear the tip for further evacuation during the next "ON" cycle.

It should be noted that the hydraulic back flow described above only works when the collection bottle is at a level higher than the patient. Assume that the collection bottle was at a level lower than the patient. Once drainage has started and the tube is filled, a siphon action will result and consequently have the effect of continuous suction. It is therefore, most important when using intermittent suction that the fluid collection bottle be at a level higher than the patient in order to have truly intermittent suction.

Note: It is important to remember that when the collection bottle is at the same height as the patient, the set vacuum is applied to the patient with no gains or losses. If the collection bottle is placed higher than the regulator, the vacuum applied to the patient is reduced from the set vacuum by a factor of approximately 22 mm Hg for each vertical 12 inches (1.83 mm Hg per inch) of separation. If the bottle is then lowered, the applied suction increases from the previous value by 22 mm Hg for each 12 inches moved.

1.2 Description of Unit

The Intermittent Suction Unit is a dual purpose unit which provides either intermittent or continuous suction.

When used as an intermittent suction unit, both the "ON" and "OFF" timing cycles are independently adjustable within a range of 3 to 30 seconds. These are pre-set at the factory to provide approximately 15 seconds "ON" and 8 seconds "OFF" at a supply vacuum of 425 mm Hg.

Note: The duration of both timing cycles will vary for different supply vacuums.

In the intermittent and continuous modes the vacuum is completely adjustable throughout a range of zero to approximately full line vacuum with the gauge graduated to 200 mm Hg. Full regulator vacuum is available when the regulator control knob is turned fully clockwise.

Since only two controls are normally used, simplicity of operation is assured. The Intermittent Suction Unit contains a hidden locking tool (located behind the Ohmeda nameplate label on the front cover) which can be used to lock both the regulator control knob and the selector knob at the desired setting (Section 2.4 E.). A wide variety of direct-mounting and bracket-mounting configurations are available (See Section 5, Illustrated Parts).

The maximum flow rate in the Intermittent mode is limited to 8 L/min. There are two reasons for limiting the flow rate:

1. High flows, while in the on or suctioning portion of the cycle, could be extremely discomforting to the patient due to the speed at which the stomach can be decompressed by the action of the suction.
2. With slower flow rates there is less possibility of occlusion of the tubing, thus allowing for more complete emptying of the stomach.

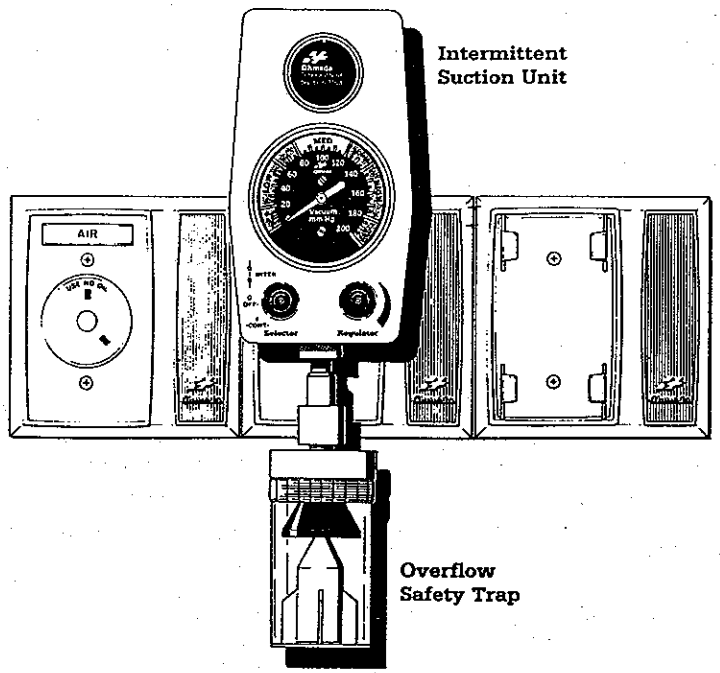


Figure 1
The Intermittent Suction Unit with Overflow Safety Trap Attached to Wall Outlet

1.3 Specifications

1. Factory Pre-set Timing Cycles (Intermittent Mode):

   ON Time Cycle: 15 seconds ± 1.5 seconds
   OFF Time Cycle: 8 seconds ± 1.5 seconds

2. Vacuum Range:

   Intermittent mode – 0 to approximately full line vacuum (with the gauge calibrated to 200 mm Hg)

   Continuous mode – 0 to approximately full line vacuum (with the gauge calibrated to 200 mm Hg)

3. Factory Pre-set Flow Rates:

   Continuous Mode: In excess of 80 L/min. at full increase setting with a vacuum supply of 15 in. Hg (380 mm Hg) or greater.

   Intermittent Mode: 8 L/min. ± 1 L/min. (preset between 80 mm Hg and full regulator vacuum) with a vacuum supply of 15 in. Hg (380 mm Hg) or greater. Note: Specified flow values are for units without fittings. Fittings will decrease maximum flows.

4. Gauge Accuracy: ± 5%

5. Weight: 1 lb. 12 oz. (0.79 Kg)

6. Dimensions:

   Height: 6.63 in (16.7 cm)
   Width: 3.5 in (8.9 cm)
   Depth: 4.75 in (11.9 cm)

   Note: The Intermittent Suction Unit has electrical continuity between the inlet and outlet connections.

2/Functional Description

How the Vacuum Circuit Works

Please refer to the flow schematic in Figure 4. With no vacuum applied or when vacuum is first applied all the unilogic gates are in their rest state. The vacuum for the unit is connected at the point marked Vacuum Supply. The vacuum then starts to evacuate the OFF volume reservoir. The rate of emptying of this OFF reservoir is controlled by the preset OFF timing control.

When the OFF reservoir has been evacuated to 5-8 in Hg vacuum (125-200 mm Hg), Unilogic Gate #2 changes state because the vacuum in the OFF reservoir is applied to the control port (V) of module #2. See Figure 5.

In Figure 5, note that the normally open (NO) port of unilogic gate #2 is blocked by the valve. This prevents air from flowing in and breaking the vacuum. The Normally Closed (NC) port is now open and the vacuum supply is connected directly through the normally closed (NC) port to the common (C) port. This connects the full line vacuum to the control ports (V) of both Unilogic Gate #3 and #4 as well as the ON volume reservoir.

Air cannot break the vacuum being developed from unilogic Gate #2 because the NO port which vents to atmosphere is blocked.

Similarly unilogic Gates #3 and #4 do not vent because the NO ports are blocked.

At this time the ON reservoir is now being evacuated through the preset"ON" timing control.

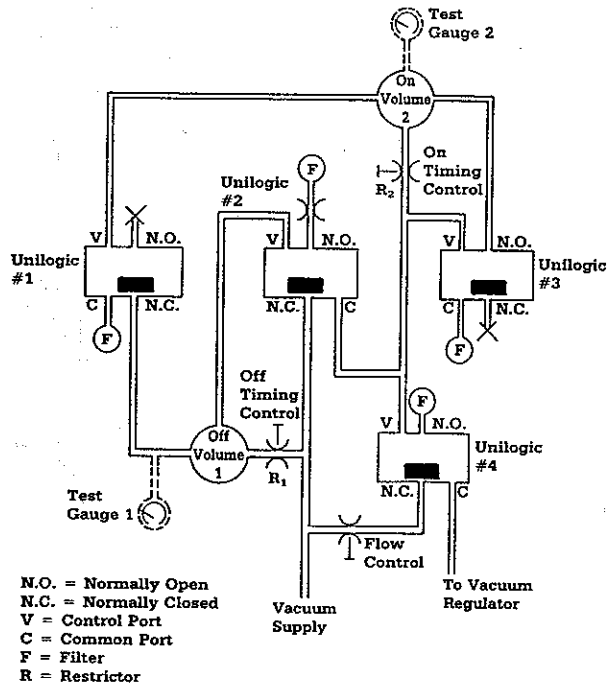


Figure 4
State 1-with Vacuum Applied and OFF Volume Reservoir Evacuated (with Test Gauges Shown)

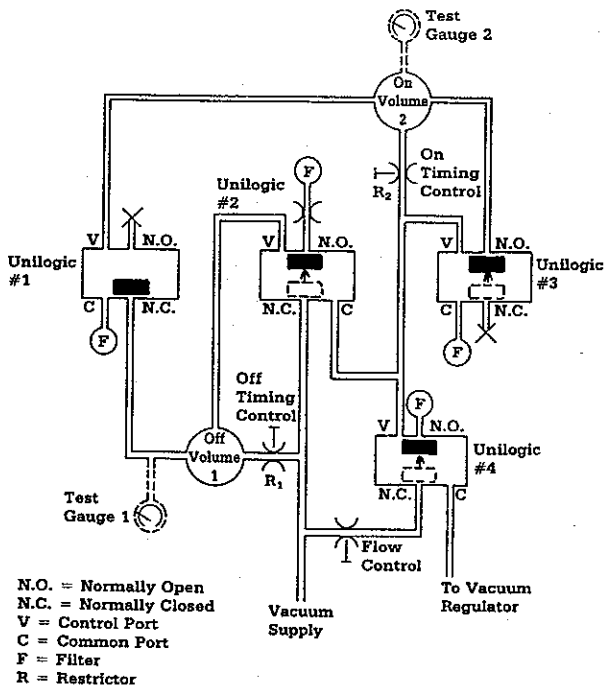


Figure 5
Unilogic Gate #2

2/Functional Description

The ON volume reservoir is evacuated to approximately 5-8 in Hg vacuum (125-200 mm Hg) and this vacuum is applied to the V port of Unilogic Gate #1. See Figure 6. This causes gate #1 to switch and connects the C port to the NC port of Unilogic Gate #1. Air enters the C port through the filter (F) and passes through the NC port to the OFF volume reservoir. This breaks the vacuum in the OFF reservoir and sets off a chain reaction.

1. The vacuum at the V port of Unilogic Gate #2 is broken causing that device to return to its "rest" state with the N.O. port connected to the C port.
2. Air enters through filter F to the N.O. port of Unilogic Gate #2 through a restrictor. This restrictor delays the depletion of vacuum in Unilogic Gate #2. This ensures the off volume reservoir returns to atmospheric pressure before any further switching.
3. When the vacuum in unilogic gate #2 is depleted to 5-8 in Hg, Unilogic Gate #2 switches. Air enters Unilogic Gate #2 through filter F and a restrictor on the N.O. port. The restrictor briefly delays the venting of Unilogic Gate #2 to ensure complete venting of the OFF volume reservoir.
4. As the vacuum in Unilogic Gate #2 depletes to 5-8 in Hg, Unilogic Gates #3 & #4 switch. Simultaneously, air comes in through the C port of gate #3 to break the vacuum in the On reservoir and air also comes in through the NO port of the Unilogic Gate #4. This air passes through port C of Gate #4 to return the patient circuit to atmospheric pressure, thus relieving all vacuum in the regulator circuit.
5. When the "ON" reservoir vacuum is depleted to 5-8 in Hg Unilogic Gate #1 returns to its rest state, closing the "OFF" volume reservoir circuit. See Figure 7.
6. This completes one cycle and a new cycle is started as the air in the OFF reservoir is again evacuated by the vacuum supply.

The time it takes to evacuate the OFF reservoir determines how long the vacuum to the patient's suction tube is OFF. The time it takes to evacuate the ON reservoir determines the amount of time the vacuum to the patient's suction tube is ON. These ON and OFF times are varied separately, by two internal preset timing control valves, one for the ON reservoir and one for the OFF reservoir.

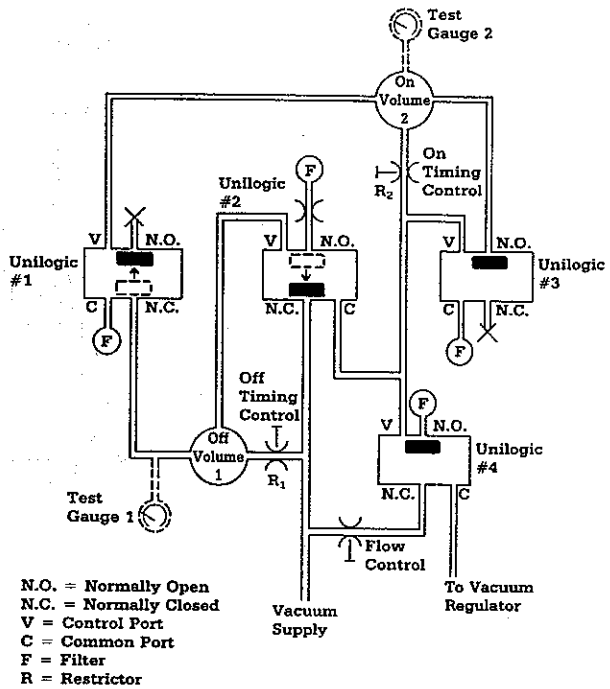


Figure 6
Vacuum Applied and ON Volume Reservoir Depleted to 5 to 8 Inches of Murcury.

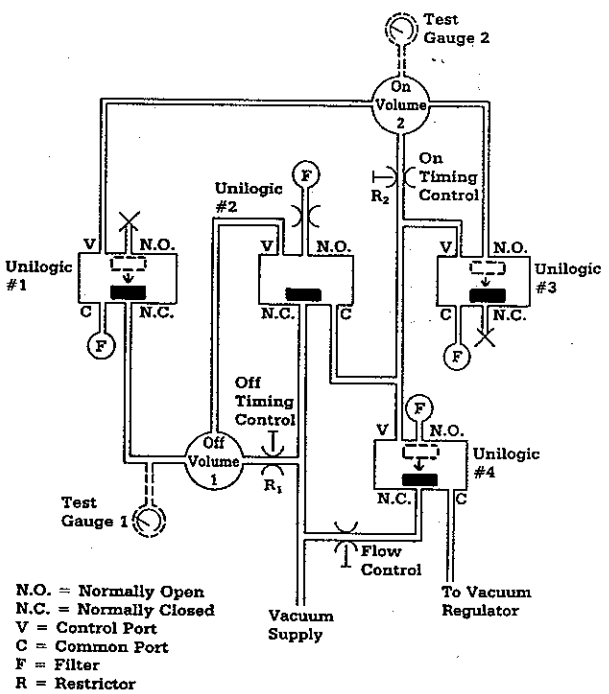


Figure 7
Vacuum Applied and ON Volume Reservoir Depleted to 5 to 8 Inches of Murcury With Unilogic Module 2 Vented.

2/Setup and Operation

2.1 Equipment Setup

CAUTION: An Overflow Safety Trap Assembly should be used whenever the Intermittent Suction Unit is used to help prevent exudate from entering the regulator. Most problems with suction regulators are caused by accumulations of exudate in the regulator. The use of the overflow safety trap assembly will help prevent this and extend the life of the suction equipment.

Mounting

1. Mount the regulator on the available mounting system. If the Intermittent Suction Unit is equipped with an adapter for wall outlets, mount it on the wall by inserting the adapter into the vacuum wall outlet.
2. Mount the collection bottle at the proper level.

   Note: In order to take advantage of the hydraulic back flow that is available with intermittent suctioning, the collection bottle must be located above the level of the patient. If fluids are pulled up the tube by suction, gravity will tend to push them back toward the patient when suction is released during the off cycle. If the collection bottle is placed at a level below the patient, a siphon action will develop resulting in continuous rather than intermittent suction.

Connection

1. Connect the overflow safety trap to the bottom of the regulator as shown in Figure 2.
2. Connect the collection bottle center port to the overflow safety trap with the appropriate vacuum tubing.
3. Perform the checkout procedure.

WARNING: The checkout procedure must be performed before using this equipment on a patient. If the regulator fails any part of the checkout procedure, it must be removed from service and repaired by qualified service personnel.

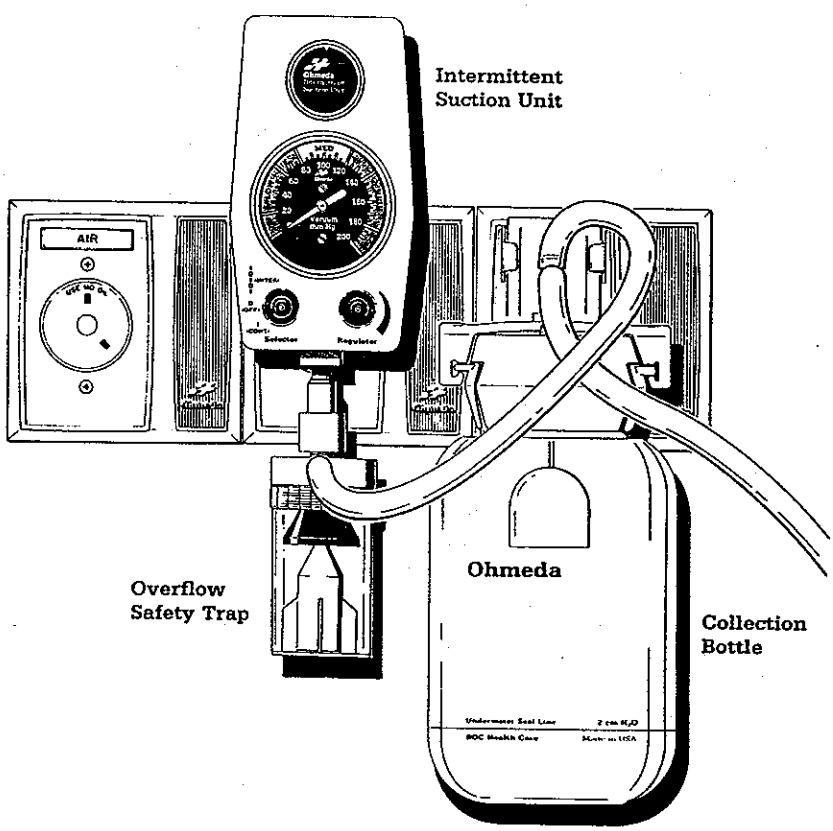


Figure 2
Regulator with Overflow Safety Trap and Collection Bottle Attached

2/Setup and Operation

2.2 Checkout Procedure

WARNING: The checkout procedure must be performed before using this equipment on a patient. If the regulator fails any part of the checkout procedure, it must be removed from service and repaired by qualified service personnel.

Before the suction regulator is used, it must be tested for correct operation as outlined below. All tests must be performed and the regulator must be positioned in the vertical operating position, while plugged into a working vacuum outlet (15 in. Hg minimum vacuum).

Note: In the text of this manual, the graphic reference for

```
I
0
I  (INTER)
0
I
```

will be indicated as I0I0I (INTER).

1. Switch the selector knob to the 0 (OFF) position and then rotate the regulator control knob one full turn clockwise (increase). There should be no leakage through the regulator. A leak is indicated by gauge movement when the regulator outlet is occluded.
2. Rotate the regulator control knob fully counterclockwise (decrease), switch the selector knob to the I (CONT) position and occlude the regulator outlet. Check for any leaks through the regulator by observing the gauge with the regulator outlet occluded.

   Note: There may be initial movement of the gauge needle, but the needle will return to zero.
3. Occlude the connecting tubing between the overflow safety trap and the collection bottle. Increase the suction to 80, 120, and 200 mm Hg. At each setting, slowly open and close the pinched tubing to create various flow rates through the regulator. Ensure that regulated vacuum levels are maintained at each setting.
4. Set the regulated vacuum level to the desired setting (see section 2.4 B).
5. Switch the selector knob to the I0I0I (INTER) position and occlude the connecting tubing between the overflow safety trap and the collection bottle. Ensure that the timing cycles of the regulator are 15 seconds ON and 8 seconds OFF.
6. Switch the selector knob to the 0 (OFF) position.

   If the regulator fails any part of the checkout procedure, it must be removed from service and repaired by qualified service personnel.

   Note: For complete test and calibration specifications, refer to the service manual (Stock Number 6700-0009-000), or the Suction and Oxygen Therapy Biomedical Engineering Service Manual (Stock Number 6700-0005-000).

2.3 Patient Setup

1. Set the regulated vacuum level before use to the desired setting as detailed in Section 2.4 B.
2. Connect the naso-gastric tube to the connecting tubing attached to the collection bottle patient port.

WARNING: When setting up the gastro-intestinal suction apparatus, be sure there is no draping of the connecting tubing between the collection bottle and the patient, or drainage will be impaired.

2.4 Operation

WARNING: The checkout procedure must be performed before using this equipment on a patient. If the regulator fails any part of the checkout procedure, it must be removed from service and repaired by qualified service personnel.

A. Setting the Selector Knob

Switch the selector knob to the I0I0I (INTER) position when intermittent suction is desired. Switch the selector knob to the I (CONT) position when continuous suction is desired.

B. Setting the Vacuum Level

To set the regulated vacuum level:

1. Occlude the inlet air flow with the thumb or by pinching the suction tubing, between the regulator and the collection bottle.
2. Turn the regulator control knob clockwise (to increase) or counter-clockwise (to decrease) until the gauge indicates the desired setting.

Note: It is important to remember that when the collection bottle is at the same height as the patient, the set vacuum is applied to the patient with no gains or losses. If the collection bottle is placed higher than the regulator the vacuum applied to the patient is reduced from the set vacuum by a factor of approximately 22 mm Hg for each vertical 12 inches (1.83 mm Hg per inch) of separation. If the bottle is then lowered, the applied suction increases from the previous value by 22 mm Hg for each 12 inches moved.

C. Setting the Timing Cycles

Note: A time of 15 seconds ON and 8 seconds OFF should be adequate for most patients using this type of intermittent suction.

The timing cycles are adjusted from the front of the regulator by pulling out the Ohmeda nameplate wrench and adjusting the valve screws with a ¼" flat-head screwdriver (see Figure 3). The valve screws are labeled as the OFF or ON cycle. To increase the time, turn the valve screw clockwise. To decrease, turn the valve screw counterclockwise. To aid in making time adjustments, turn the valve screw ¼ turn at a time (refer to Section 4.1 E.)

WARNING: If the screws on the timing valves are turned clockwise all the way in, the Intermittent Suction Unit *will not cycle.*

D. Setting the Intermittent Mode Flow Rate

A change in the intermittent mode flow rate is rarely needed. If there is a desire to change the flow rate from that set at the factory, contact an Ohmeda service representative or send the regulator to qualified service personnel for readjustment.

E. Locking Knobs in Position

To lock either knob (selector or regulator control) in a given position, pull out the Ohmeda nameplate wrench from the front of the regulator (see Figure 3) and tighten the screw in the center of the knob using the key located in the stem of the nameplate wrench. To unlock either knob, simply loosen the screw in the center of the knob.

F. General Information

Occasionally during intermittent suction, liquid will travel only part way up the tubing during each ON cycle. This may indicate that either:

1. The stomach may be completely drained of liquid, in which case the system should be irrigated in order to determine if the stomach is in fact empty.
2. The vacuum may not be high enough to lift the liquid all the way up the tube if the bottle is higher than the patient.

CAUTION: The Intermittent Suction Unit should be preset and checked before applying to the patient. Make all vacuum level and timing adjustments first and then connect the Intermittent Suction Unit to the patient. Use the procedure described in Section 2.4 E. to lock the selector knobs in place to prevent unauthorized changes.

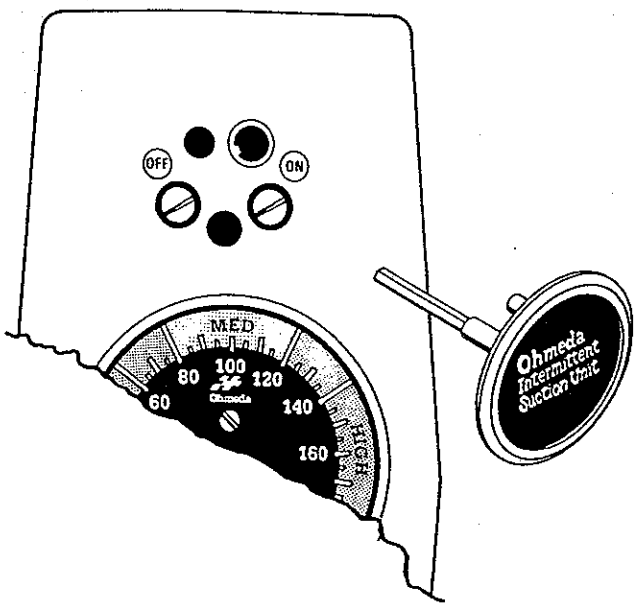


Figure 3
Setting the Timing Cycles

3/Maintenance

3.1 Repair Policy and Procedure

Warranty repair and service must be performed by Ohmeda at the address listed below.

Do not use malfunctioning equipment. Make all necessary repairs or have the equipment repaired by an Ohmeda Service Representative. Parts listed in the service manual, for this product, may be repaired or replaced by a competent, trained person who has experience in repairing devices of this nature. After repair, perform the checkout procedure (Section 2.2) to ensure that it is functioning properly, in accordance with the manufacturer's published specifications.

WARNING: Clean and sterilize all units before shipment to ensure transportation personnel and service personnel are not exposed to any hazardous contamination.

CAUTION: Only competent individuals trained in the repair of this equipment should attempt to service it.

CAUTION: Detailed information for more extensive repairs is included in the service manual solely for the convenience of users having proper knowledge, tools and test equipment, and for service representatives trained by Ohmeda.

Contact the Ohmeda Technical Support Group listed on the back cover, for any further assistance.

Whether you send the unit for warranty service or non-warranty service package it securely for protection, and ship it prepaid. Enclose the following five items:

1. A letter describing in detail any difficulties experienced with the unit.
2. Warranty information – (when less than 1 year old) a copy of the invoice or other applicable documentation must be included.
3. Purchase order number to cover repair of a unit not under warranty.
4. Return address and billing address information.
5. Person (name and telephone number) to contact for functional questions.

Address for Warranty Repairs
(New and up to one year old)

Ohmeda
3411 Commercial Avenue
Northbrook, IL 60062

Address for Non-Warranty Repairs
(Over one year old)

Ohmeda National Service Center
4507-C Mills Place
Atlanta, GA 30336

Non-warranty repairs will be made at Ohmeda's current list price for replacement part(s) plus a reasonable labor charge.

3.2 Maintenance of Suction Equipment

WARNING: The checkout procedure must be performed before using this equipment on a patient. If the regulator fails any part of the checkout procedure, it must be removed from service and repaired by qualified service personnel.

WARNING: Clean and sterilize all suction equipment before any maintenance to ensure service personnel are not exposed to any hazardous contamination.

Note: For complete maintenance and service procedures refer to the service manual (Stock Number 6700-0009-000), or the Suction and Oxygen Therapy Biomedical Engineering Service Manual (Stock Number 6700-0005-000).

Routine maintenance and inspection are important to the performance of suction equipment. The following is a suggested check list for care of suction equipment after each patient use.

1. Perform a thorough cleaning (washing of all bottles, tubing, metal connectors, etc., and removal of all organic material).
2. Perform a careful visual inspection.
3. Perform the checkout procedure.
4. Perform adjustments if required.

Check that all tubing is in good condition and connected securely. Check the overflow valve on the overflow safety trap assembly for efficiency of performance. Check that the filters are clean and in good condition to prevent entry of foreign matter into the apparatus. Intermittent Suction Units should be kept in use or used on a rotating basis. Unused equipment may tend to deteriorate.

Maintenance of the vacuum piping system is as important as maintenance of the suction equipment. The use of collection bottles and overflow safety trap assemblies protect the piping system. The flow rate at the wall outlet should be checked on a yearly basis and suitable cleaning of the outlets should be performed. The flow rate measured should meet local standards and be at least 80 L/min., while maintaining vacuum level, to ensure maximum regulator performance.

3.3 Filters

The unit contains 5 filters which should be replaced periodically. The interval of replacement will depend on the hours of usage of the regulator and the condition of the environment, but a good rule would be quarterly replacement of all 5 filters. To replace the filters, send the regulator to qualified service personnel for disassembly and filter replacement per the service manual procedures.

3/Checkout Procedures

A. Continuous Mode

Before the suction regulator is used, it must be tested for correct operation as outlined below. These tests must be performed with the regulator in its normal (vertical) operating position, while plugged into a working vacuum outlet (15 in Hg. minimum vacuum).

1. Turn off the regulator and then rotate the control knob one full turn clockwise (increase). There should be no vacuum leakage through the unit. A leak is indicated by gauge movement when the suction inlet is blocked.
2. Rotate the control knob fully counter-clockwise (decrease), and then switch the regulator to regulate mode. There should be no vacuum leakage through the unit. A leak is indicated by gauge movement when the suction inlet is blocked.

   Note: There may be an initial movement of the gauge needle, but the needle should return to zero.
3. Attach the tubing to the suction inlet and pinch the tubing to stop the flow. Increase the suction to 80, 120 and 200 mm Hg (International Units 20, 40, 60, 80, 100 kPa). At each setting, slowly open and close the pinched tubing to create various flow rates through the unit. The regulator should not hum or vibrate.
4. Turn the increase control fully clockwise. Pinch the suction inlet tubing to stop flow and check that the gauge increases to read full vacuum calibration. (International units increase above calibrated range)

B. Intermittent Mode

Switch to INTERmittent mode and ensure that open circuit flow is substantially reduced and that the timing of the cycles is 8 seconds OFF and 15 seconds ON (or at the preset intervals).

WARNING: If the unit has failed any part of the checkout procedure, it must be removed from service and repaired.

4/Disassembly and Reassembly

4.1 Disassembly

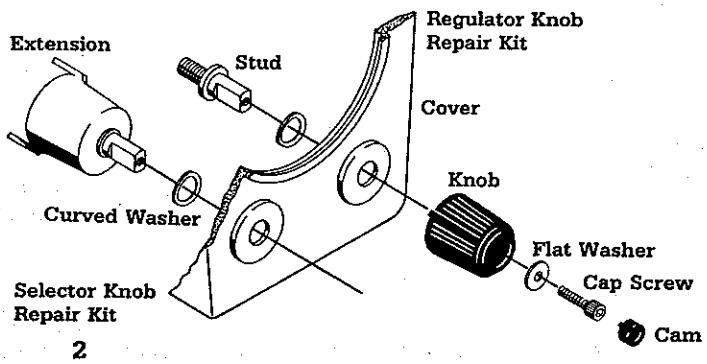
WARNING: Perform cleaning and sterilization procedures before disassembly if the unit is contaminated.

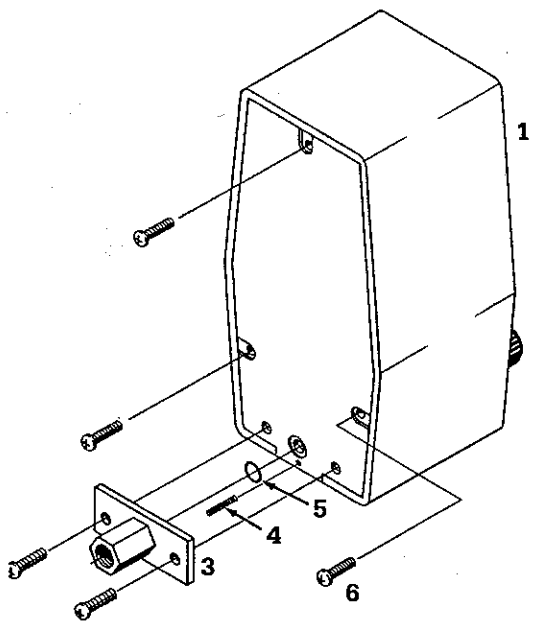
Tools required

Locking wrench (supplied with unit)

#2 Phillips screwdriver
1/16" hex key wrench
5/16" open end wrench
Wooden toothpick (to remove O-rings)
Mold Release – Dow Corning #111

1. Remove the three Phillips head screws from the back of the unit as shown in Figure 8.
2. Carefully pull the cover assembly (item #1) off of the back body.
3. To remove the gauge assembly (item #12, Figure 9), grasp the dial mounting bracket and pull straight out.
4. To remove the regulator assembly from the cover assembly, turn the vacuum adjusting knob counterclockwise until the regulator is free.
5. To remove the bellows, loosen the two set screws on the regulator assembly as shown in Figure 9.
6. If a leak is suspected in the area of the inlet connector, remove the two retaining screws. Remove the connector, with O-ring and carefully remove the conductivity spring.
7. Remove the Unilogic module by carefully pulling the unit away from the back body to release the tubing connections.
8. Remove the timing valves by pulling the controller out of the assembly. Remove and discard each filter.
9. If the selector valve needs service, carefully unscrew the center retaining screw while holding the main valve body. Remove the detent plate, ball bearings and valve body. Remove and discard the four O-rings.
10. Remove and discard the vacuum gauge bleed hole filter.
11. The flow valve can be unscrewed, if required. Take extra care when refitting the valve to ensure that the threads engage correctly. Use mold release spray to lubricate the threads and the O-ring.





Description

1. Cover and Knob Assembly
   (less gauge lens)
   Gauge Lens (Not Illustrated)
2. Selector Knob Repair Kit
   Regulator Knob Repair Kit
3. Inlet Connector
4. Conductivity Spring
5. O-Ring
6. Screw #6 × 7/8" Pan Hd.
   Hd. Type 23 St. St. (5)

Figure 8
ISU—Cover and Knob Assembly

3.4 Sterilization

Although the Intermittent Suction Unit can be sterilized with ethylene oxide, it is not recommended that the regulator be sterilized as a standard procedure after each use. The Intermittent Suction Unit should only be sterilized if it is contaminated or maintenance is to be performed.

CAUTION: Do not steam autoclave or liquid sterilize the Intermittent Suction Unit. Severe impairment to the operation of the unit will result. The only acceptable method of sterilization is with gas (ethylene oxide).

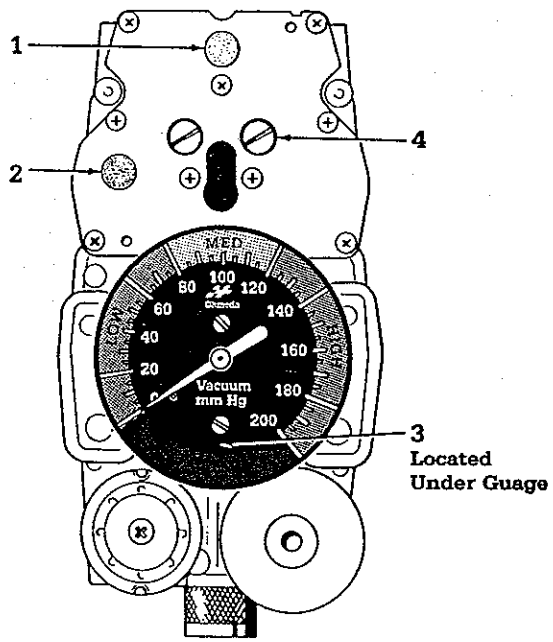
The regulator should be sterilized with the selector knob in the !0!0! (INTER) position and the regulator control knob set to full increase.

Ethylene oxide mixtures can be used at temperatures of 125–135 degrees F. Room temperature sterilization with 100% ethylene oxide can also be used. It should be noted that sterilization with ethylene oxide mixtures might cause "crazing" (minute superficial cracking) of some plastic parts. Crazing will be more pronounced when mixtures containing Freon are used.

CAUTION: Following sterilization with ethylene oxide, parts should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the material. Follow sterilizer manufacturer's recommendations for specific aeration periods required.

After each sterilization, every three months, or after servicing, remove the cover and check inside the regulator.

1. Check the condition of the filters. If they appear to have shrunk, replace filters before putting the regulator back in service. See Figure 4.
2. Check both timing control valves to make sure they are securely in place.



Description	Stock Number
1. Filter, Beige	0221-5880-300
2. Filter, Green	0221-5879-300
3. Filter, Gauge Bleed Hole	0210-6540-300
4. Filter (2), Timing Control Valve (Not Shown)	0221-5883-300

Figure 4
Filter Locations – (Check filter condition after each sterilization, every three months, or after servicing).

4/Troubleshooting

The maintenance procedures in the preceding sections and these troubleshooting procedures should be undertaken only by competent individuals who have general knowledge and experience with devices of this nature.

Read completely through each procedure before starting the procedure. Any exceptions may result in failure to properly and safely complete the procedure attempted.

CAUTION: Cleanliness is of utmost importance. The Intermittent Suction Unit should be disassembled when cleaning or repairing in as clean an environment as possible. Dirt or debris in any removable part such as the timing and flow control valves can be cleaned out. However, any dirt in the molded plastic base will be impossible to remove and may prevent the Intermittent Suction Unit from operating correctly. In such cases the base should be replaced. To have the base replaced refer to the service manual or contact your nearest Ohmeda Service Center.

4.1 Unit Will Not Cycle

A. Selector Knob not in Proper Position

If the regulator fails to function in the IOIOI (INTER) mode, the selector knob may not be in the proper position. Be sure that the selector knob is in the IOIOI (INTER) position. Also rotate the regulator control knob in the increase direction to ensure that an increasing vacuum is available. (Momentarily turn the selector knob to I (CONT) to ensure that continuous vacuum is available.)

CAUTION: The Intermittent Suction Unit will always start in the OFF cycle; so be sure that you wait at least 20 seconds with the outlet of the regulator tube occluded to determine if the regulator is functioning.

B. Knobs (selector or regulator control) locked in position.

If the selector or regulator control knob is locked in position, pull out the Ohmeda nameplate wrench from the front of the regulator (see Figure 5) and loosen the screw in the center of the knob (refer to Section 2.4 E.).

C. Suction tubing not in place.

Check to see that all tubing from the patient to the collection bottle and back to the Intermittent Suction Unit is connected properly with no leaks or loose fittings. Ensure that the collection bottle lid is fitted properly.

Note: Continue the troubleshooting procedure on the Intermittent Suction Unit with the regulator outlet occluded.

D. Insufficient vacuum to drive the regulator

The vacuum supply must be at least 6 in. Hg (152 mm Hg) for the unit to operate. Remember that, as the collection bottle is raised above the patient, more suction is required to lift the liquid up the tube.

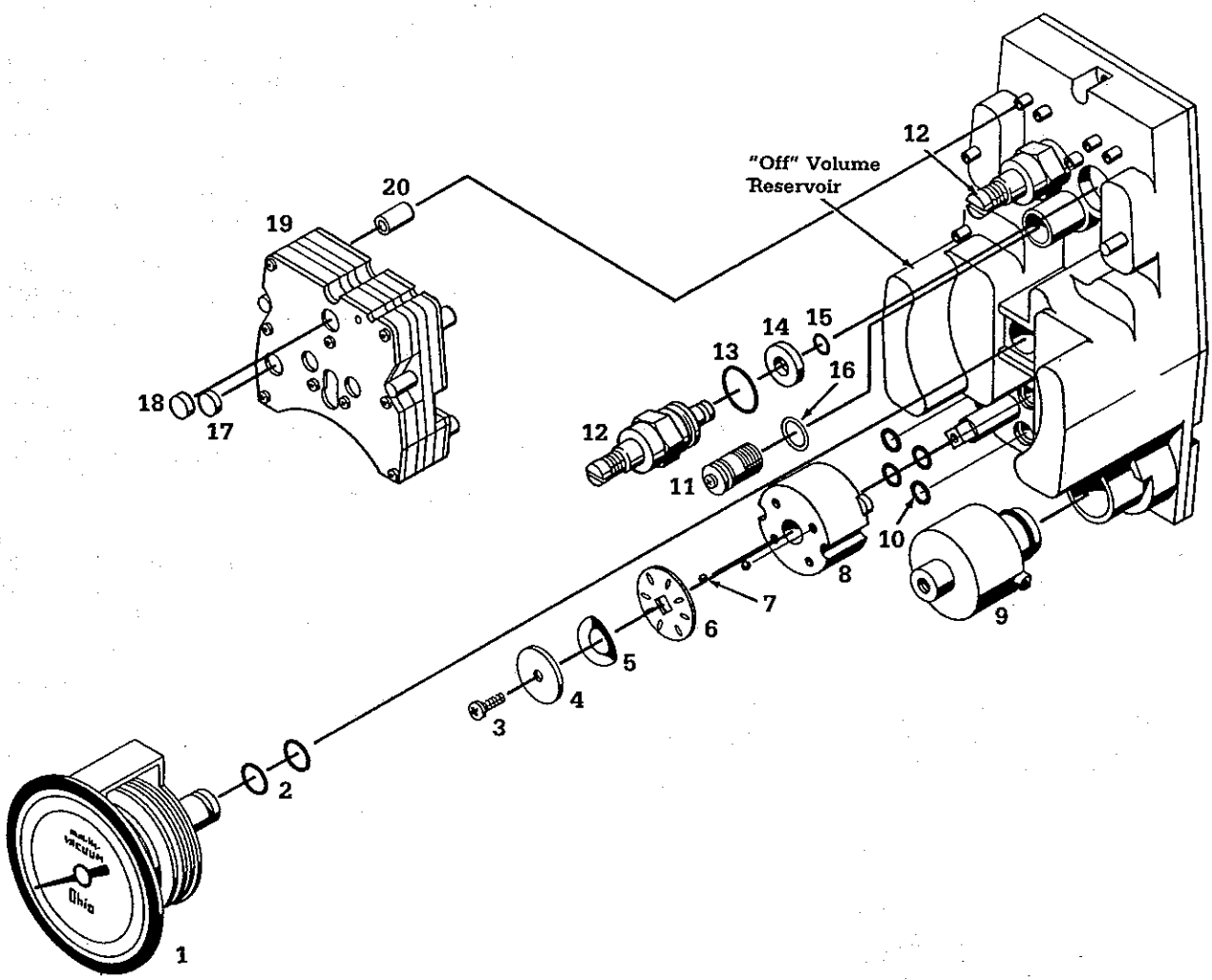
E. ON/OFF cycles inhibited by timing valves too tightly adjusted.

WARNING: If the screws on the timing valves are turned clockwise all the way in, the Intermittent Suction Unit *will not cycle.*

To set the timing cycles, perform the following procedure:

1. Pull out the Ohmeda nameplate wrench from the front of the regulator (See Figure 5).
2. Occlude the regulator inlet.
3. Switch the selector knob to the IOIOI (INTER) position.
4. Wait 20 seconds.
5. If the regulator does not cycle to the ON cycle, use a ¼ inch flat-head screwdriver to turn the OFF valve screw (next to "OFF" label) counterclockwise until the ON cycle activates.
6. Wait 20 seconds.
7. If the regulator does not cycle back to the OFF cycle, use a ¼ inch flat-head screwdriver to turn the ON valve screw (next to "ON" label) counterclockwise until the OFF cycle activates.
8. Adjust each timing cycle to the normal setting of approximately 15 seconds ON and approximately 8 seconds OFF. To increase the time, turn the valve screw clockwise; to decrease, turn the valve screw counterclockwise.

If other problems exist, refer servicing to qualified service personnel.



Description

1. Gauge Assembly w/O-Rings
2. O-Rings (2)
3. Screw #6 × ½" Pan Ph. Hd. Type 25
4. Retaining Washer
5. Spring Washer
6. Detent Plate
7. Ball (4)
8. Valve Body
9. Regulator Assembly
10. O-Ring (4)
11. Flow Control Valve
12. Timing Control Valve (2)
13. O-Ring (2)
14. Filter, Timing Control Valve (2)
15. O-Ring (2)
16. O-Ring
17. Filter, Green
18. Filter, Beige
19. Unilogic Module
20. Tubing, Length ⅝" (6)

Figure 9
ISU—Exploded View

4.2 Reassembly

1. Lubricate the four, new, selector valve O-rings with Dow Corning No. 111 and place in the proper locations on the base. Place the selector valve body on the base and assemble the detent/ball assembly. Replace the main screw and tighten.

   Note: If the main screw is over tightened, it will strip the threads and the base will need to be replaced.

   Place the selector valve in the center position (OFF).

2. Lubricate the O-rings on the timing control valves with Mold Release spray and fit them into the base with new filters.

3. Wet the mounting tubes on the Unilogic module and carefully fit the module onto the base assembly mounting posts. Ensure that all the tubes are connected correctly.

4. Fit the new vacuum gauge bleed filter into the base assembly.

5. Fit the vacuum gauge into the base assembly. Lubricate the"O" rings with Mold Release spray.

6. Knob reassembly detail:

a. Assemble the cap screw, flat washer, knob, cover, curved washer and stud in the order shown in the exploded view Figure 10).

b. Tighten the cap screw fully to lock the knob. Use only the special tool provided with the unit.

c. Locate the tab of the cam 90 degrees counterclockwise from the tab inside the knob. See "Knob End" illustration.

d. Place the cover on a flat surface, under a hand press or drill-press (power off) and with a flat bottomed ram, press the cam onto the head of the cap screw. Take care not to apply too much pressure or the cover will be damaged.

7. Screw the regulator onto the regulator knob stem inside the front cover.

8. Position the controls and regulator to the configuration shown in Figure 11 and fit the gauge lens into the unit. Lubricate the regulator O-rings with Mold Release spray.

9. Assemble the front cover onto the base assembly, ensuring the correct location of the regulator, selector and gauge lens. (If the gauge lens is properly in place it will rotate freely.)

10. Replace the three case screws.

11. Place the conductivity spring and a new O-ring lubricated with Dow Corning No. 111 onto the back plate. Refit the vacuum outlet connector and replace the two retaining screws.

CAUTION: Prior to placing the unit back into service, after disassembly or cleaning, perform the checkout procedure.

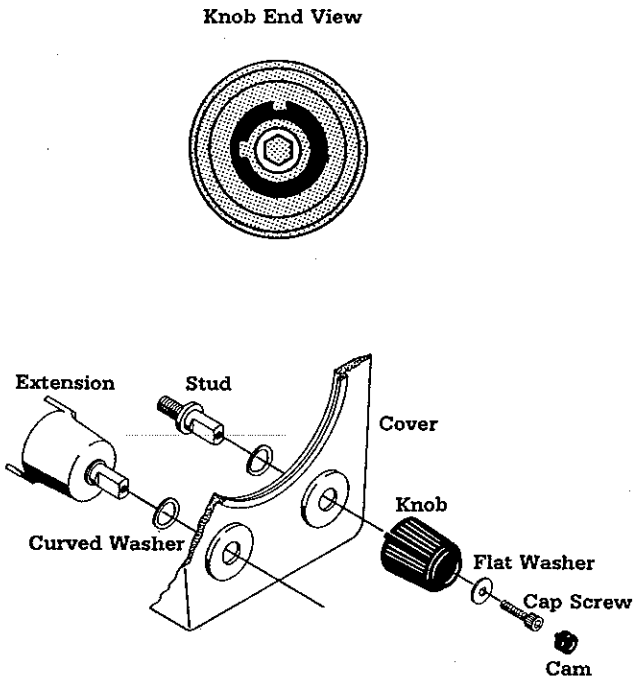


Figure 10
Knob Replacement

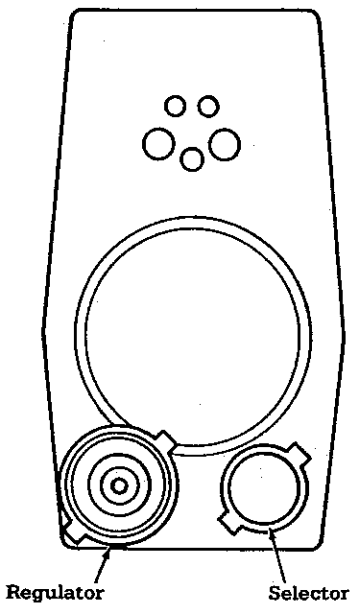


Figure 11
Front Panel Assembly

5/Tests and Calibration

Recommended equipment, tools and lubricant

- 0 to 600 mm Hg (International units 0-100 KPa) Vacuum Column or Gauge ±2%
- Stop watch
- Leak Flow Tester (bubble tester)
- 0 to 8 liters per minute Vacuum Flow Tube ±5%
- 0 to 160 liters per minute Vacuum Flow Tube ±5%
- 0 to 70 centimeters H_2O Vacuum Column or Gauge ±1 cm H_2O
- ISU Test Gauge Set (Fault Finding Only) P/N 0221-5895-800
- Dow Corning No. 111 Lubricant P/N 0395-3164-300
- Mold Release Spray P/N 0220-0078-300
- 1/4 inch Flat-head Screwdriver
- No. 2 Cross-head Screwdriver
- Snap-ring Pliers
- Tweezers
- Open-end wrench set--Imperial, 5/16, 3/8, 9/16 inch sizes
- 1/16 Hex key wrench

5.1 Continuous Mode

1. Connect the unit to a vacuum source and the suction inlet to a bubble bottle leak detector (see Figure 12). With the unit switched off, there should be no leak. A leak is indicated by continuous bubbling.
2. Switch the selector switch to CONTinuous mode, and turn the regulator control fully CCW. There should be no leak. A leak is indicated by continuous bubbling.
3. Connect the regulator direct to a vacuum source. Connect the suction inlet to the 0 to 600 mm Hg (International units 0-100 KPa) manometer. Set the unit to the CONTinuous mode and check to ensure that it regulates smoothly and maintains a set pressure.
4. While in the CONTinuous mode, turn the regulator control to the full INCREASE position. Check that the gauge increases above the regulated range to the FULL VAC indication (not international units).

   Note: Factory specifications state that with 25 inches of Hg (630 mm Hg) supplied the unit must deliver at least 15 inches of Hg (381 mm Hg).
5. In the CONTinuous mode, check the gauge reading to ensure that it is within 5 percent of the manometer reading. Use the settings of 80, 120, and 200 mm Hg for this check. (International units are set for 20, 40, 60, 80, and 100 KPa.)
6. In the CONTinuous mode with FULL increase setting, check the maximum flow using the 0 to 160 L/min Air Flow Tube. Typical flow (for a unit with fittings) should be 55 L/min with a minimum 15 in Hg vacuum supply.
7. Block the suction inlet and set the vacuum to 200 mm Hg (International units 40 KPa). Turn the regulator control CCW and ensure that the gauge value decreases.
8. Check to ensure that there is electrical conductivity between the inlet and outlet adapters.

5.2 Intermittent Mode

1. Switch the unit to the INTERmittent mode of operation and set it to regulate at 120 mm Hg (International units 20 KPa). Measure OPEN FLOW when the unit is in the ON cycle. Flow should be 8 ±1 L/min.
2. Measure the timing of the OFF cycle. It should be preset for 8 ±1.5 seconds (adjust with the OFF timing valve).
3. Measure the timing of the ON cycle. It should be preset for 15 ±1.5 seconds (adjust with the ON timing valve).
4. Repeat steps 2 and 3 until both cycles operate without further adjustments.
5. If the timing adjustments fail to bring the unit's cycles into the time specifications of steps 2 and 3, test the unit with the test gauge set.

If the unit has failed any part of the checkout procedure it must be removed from service and repaired.

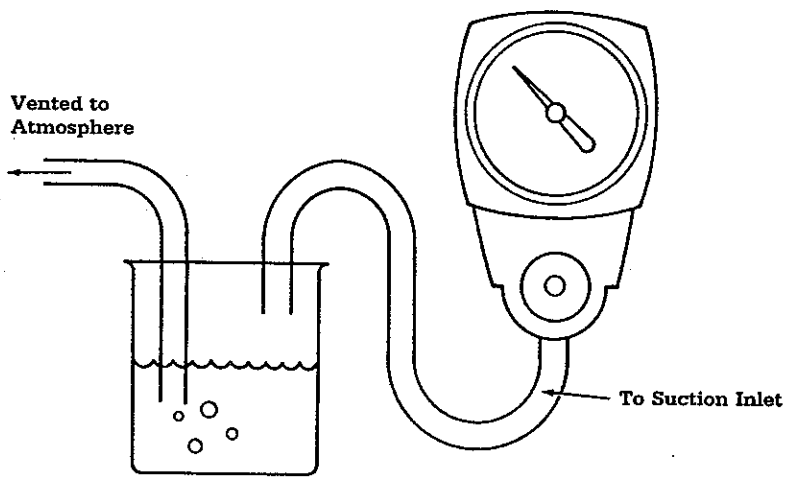


Figure 12
Bubble Bottle Leak Detector

5.3 Checkout with Test Gauges

If a visual inspection does not reveal the cause of the problem, further diagnosis is required. The following procedures should be performed with vacuum test gauges attached to the unit to aid diagnosis. These gauges come as Kit #0221-5895-800 and are attached to the unit as shown in Figure 13. See General Description of Unilogic Module for schematic with test gauges.

Set-up

1. Remove the two yellow dust caps (T2 and T6, Figure 13).
2. Connect a gauge to each port as shown in Figure 13.
3. Connect the ISU to a vacuum source.
4. Turn the selector knob to INTER.

A. OFF Cycle: Gauge 1

Observe gauge #1 (See Figure 13). If the vacuum does not slowly increase after a few seconds, one or more of the following faults may be the cause:

1. OFF timing control valve is plugged.
2. The OFF timing control valve O-rings are leaking.
3. A leak in the OFF volume reservoir.
4. A leak in the Unilogic module.

The problem is probably due to #1 or #2, so remove the OFF timing control valve, disassemble, clean, replace O-rings, and try again.

The problem is probably #3 if the seal around the outside edge of the OFF volume reservoir appears to be cracked, crazed or foggy. These conditions would indicate a leak and the entire base should be replaced. Replace the base using the disassembly/reassembly procedures or contact the nearest Ohmeda Service Center.

Condition #4 can be caused by cracked tubing or leaks in the unilogic module. Replace if defective.

The unit should now function at least through one OFF cycle and begin the first ON cycle. You will note that as the vacuum level in the OFF volume reservoir reaches approximately 5 to 8 in Hg (125-200 mm Hg), the ON cycle begins and vacuum slowly builds up in the ON volume reservoir (gauge #2), at the same time, the vacuum will continue to build up on gauge #1.

B. ON Cycle: Gauge 2

If the vacuum does not build-up in the ON volume reservoir (gauge #2) one or more faults should be the cause:

1. ON timing control valve is plugged.
2. ON timing control valve O-rings are leaking.
3. Yellow caps are leaking.
4. Leak in ON volume reservoir.
5. Leak in the Unilogic module.

To analyze the ON timing valve, ON reservoir or Unilogic module for faults, follow the same procedures as previously outlined for the OFF cycle.

C. ON-OFF Cycle

During a complete unit cycle, the unit should begin slow evacuation of the OFF volume reservoir to approximately 5 to 8 in Hg (125-200 mm Hg) on Gauge #1 and then slow evacuation of ON volume reservoir until approximately 5 to 8 in Hg (125-200 mm Hg) is indicated on Gauge #2.

Then both gauges should momentarily drop to zero and the OFF volume reservoir should start to evacuate again.

During the evacuation of the ON volume reservoir the unit should be in an ON cycle (vacuum to patient).

If there is no vacuum at the bottom connection when ON volume reservoir has vacuum readings on Gauge #2, one of the following may be at fault:

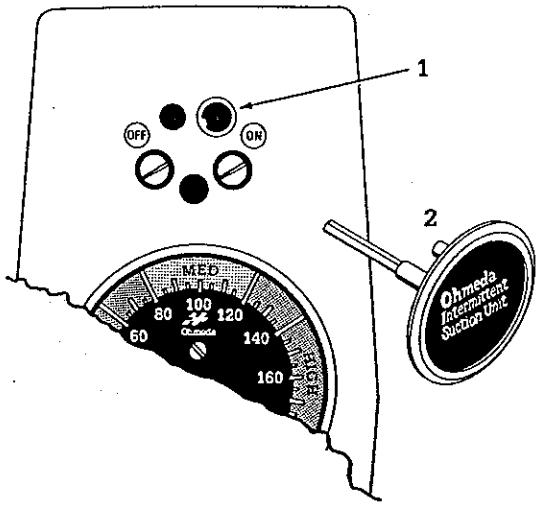
1. Preset flow control valve shut-off or plugged (normally set for 8 L/min flow).
2. Regulator control shut-off (Full decrease).
3. Leak in mode selector valve.
4. Leak or defect in regulator gauge.
5. Defective Unilogic module.

Again the possible problems have been listed in order of probability. If the fault is not cured, try the following steps:

a. Unscrew the flow control valve and replace the sealing O-ring.
b. Remove regulator assembly from base and plug hole with your thumb.

The unit should now operate through OFF and ON cycles. By observing the gauges #1 and #2, you will notice that when the selector valve is rotated in the "INTER" position the gauge #1 immediately begins rising. At this time the unit is in the OFF mode. When the vacuum reaches approximately 5 to 8 in Hg (125-200 mm Hg) the unit switches ON and the vacuum slowly builds up in the ON volume reservoir. When the vacuum in the ON volume reservoir reaches approximately 5 to 8 in Hg as shown on gauge #2, the gauges will both fall to zero, and the cycle repeats. A defective regulator is indicated by this pattern of operation.

5/Illustrated Parts

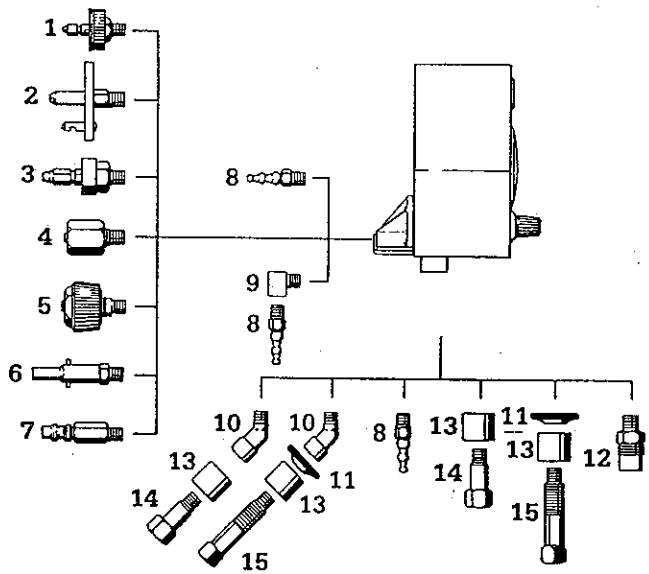


For a complete list of illustrated parts and stock numbers, refer to the Service Manual (6700-0009-000).

Note: Intermittent Suction Units can be retrofitted for Posi-Pulse operation with a retrofit kit.

Description	Stock Number
1. Holding Clip	0402-2018-300
2. Nameplate Wrench	6700-0033-400

Figure 5
Ohmeda Nameplate Wrench Assembly

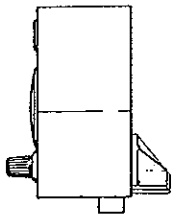
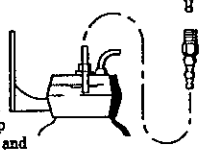
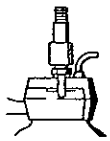
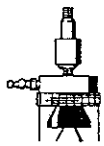
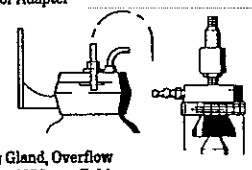
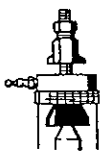
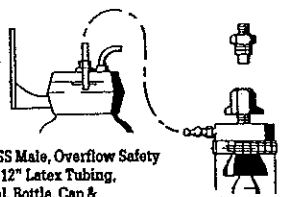


Description	Stock Number
1. Diamond Outlet Adapter	0221-2685-802
2. NCG Adapter (Round)	0221-0204-802
NCG Adapter (Rectangular)	0221-0205-800
3. Schrader Adapter	0221-0690-731
4. DISS Union Nut	0204-6602-535
DISS Union Gland	0204-7979-535
5. DISS Hand-I-Twist Nut and Gland	0204-6717-800
DISS Hand-I-Twist Nut	0204-6702-700
DISS Union Gland with O-Ring Grove	0204-7993-535
O-Ring	0210-0700-300
6. OES Adapter	0221-0152-300
7. Puritan Adapter	0221-0106-300
8. Nipple, Tubing	0204-9020-535
9. Street Ell, 90 degrees	0213-4005-335
10. Street Ell, 45 degrees	0213-6126-330
11. Lock Nut	0221-5734-535
12. Vacuum DISS Male	0204-7989-535
13. Locking Sleeve	0221-6260-300
14. Adapter Fitting	0221-6262-300
15. Adapter Fitting, Threaded for Suction Regulator	0221-6263-300

Figure 6
Fittings for the Intermittent Suction Unit

5/Illustrated Parts

Table 1
Suction Regulator Configurations

		Diamond	Hand-I-Twist	DISS Nut & Gland	Schrader	NCG (rect.)	NCG (rnd.)	Puritan	OES	Tubing Nipple
ISU Regulator Less Fittings 6700-0011-900										
w/Tubing Nipple		0221-5786-810	0221-5786-817	0221-5786-814	0221-5786-813	0221-5786-811	0221-5786-812	0221-5786-816	0221-5786-815	.....
w/Tubing Nipple, 12" Latex Tubing, 1/2 gal. Bottle, Cap & Float Assembly and Wall Bracket		0321-8035-810	0321-8035-811	0321-8035-812	0321-8035-813	0321-8035-814	0321-8035-815	0321-8035-816	0321-8035-817	.....
w/Locking Gland, 1/2 gal. Bottle Cap & Float Assembly & Floor Bracket		0321-8034-810	0321-8034-811	0321-8034-812	0321-8034-813	0321-8034-814	0321-8034-815	0321-8034-816	0321-8034-817	.....
w/Locking Gland		0221-5796-810	0221-5796-817	0221-5796-814	0221-5796-813	0221-5796-811	0221-5796-812	0221-5796-816	0221-5796-815	0221-5787-811
w/Locking Gland w/Overflow Safety Trap w/Regulator Adapter		0321-8036-810	0321-8036-817	0321-8036-814	0321-8036-813	0321-8036-811	0321-8036-812	0321-8036-816	0321-8036-815	.....
w/Locking Gland, Overflow Safety Trap, 12" Latex Tubing, 1/2 gal. Bottle, Cap & Float Assembly & Wall Bracket		0321-8037-810	0321-8037-811	0321-8037-812	0321-8037-813	0321-8037-814	0321-8037-815	0321-8037-816	0321-8037-817	.....
w/DISS Male		0221-5797-810	0221-5797-817	0221-5797-814	0221-5797-813	0221-5797-811	0221-5797-812	0221-5797-816	0221-5797-815	0221-5787-812
w/DISS Male & Overflow Safety Trap w/DISS Wing Nut & Gland		0321-8038-810	0321-8038-811	0321-8038-812	0321-8038-813	0321-8038-814	0321-8038-815	0321-8038-816	0321-8038-817	.....
w/DISS Male, Overflow Safety Trap, 12" Latex Tubing, 1/2 gal. Bottle, Cap & Float Assembly & Wall Bracket		0321-8039-810	0321-8039-811	0321-8039-812	0321-8039-813	0321-8039-814	0321-8039-815	0321-8039-816	0321-8039-817	.....
w/45°Locking Gland (For Bottle Stand)		.....	.....	.....	.....	.....	.....	.....	.....	0221-5787-810

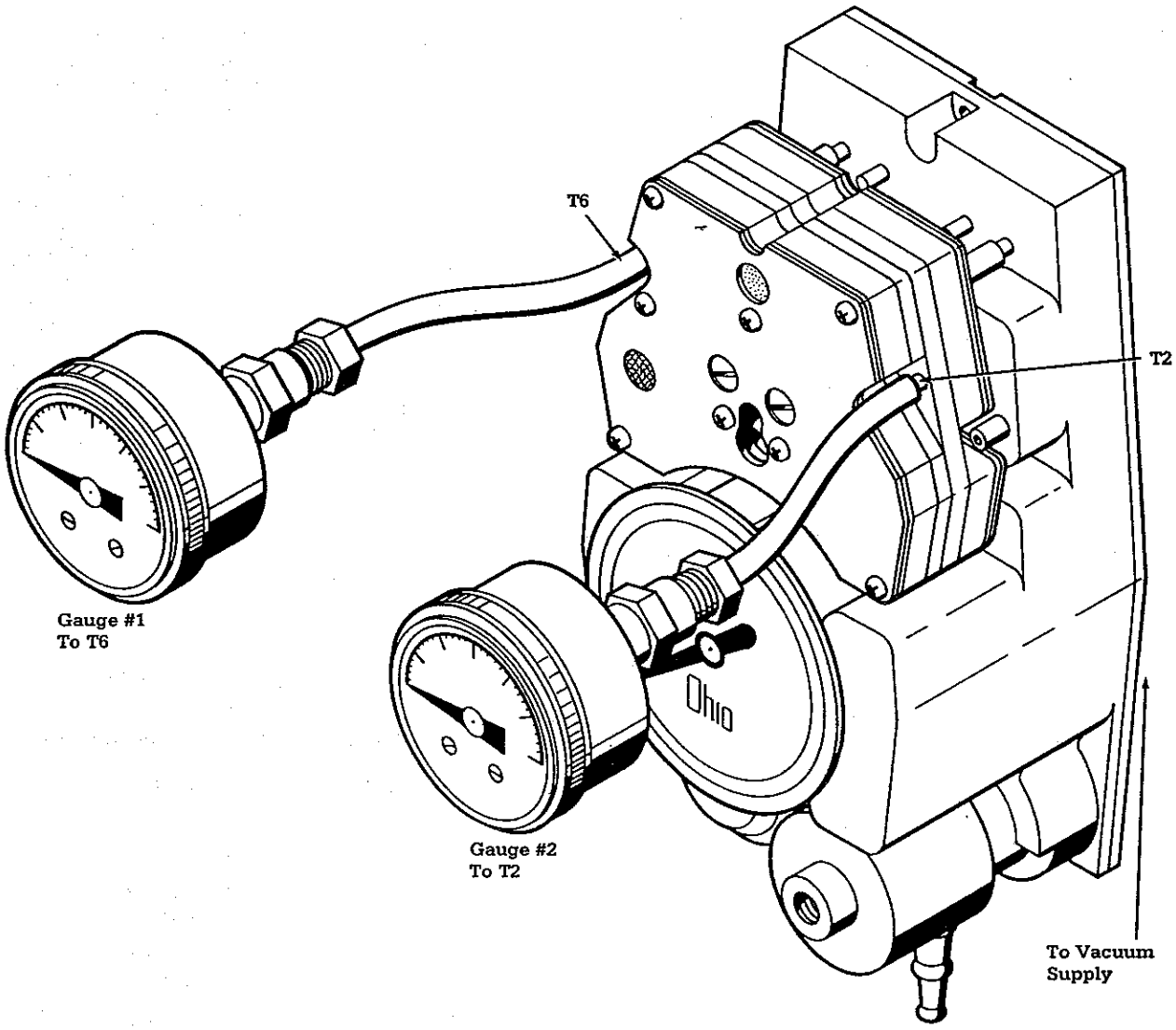


Figure 13
Set-Up of Test Gauges (0221-5895-800)

6/Cleaning and Sterilization

Cleaning

The intermittent suction regulator requires cleaning only when it becomes fouled during use. Disassemble the regulator for cleaning as outlined in Section 4. Clean the regulator with luke warm water and mild detergent only.

Sterilization

The regulator does not require sterilization unless it has become contaminated or has been used on an infectious patient. Use only gas sterilization techniques.

CAUTION: Steam autoclaving or liquid sterilization of this regulator should be avoided, as damage to the unit may occur. The only acceptable method of sterilization for this unit is gas (ethylene-oxide).

When sterilizing the regulator, set the unit to REG mode and the vacuum control to FULL increase. Follow the sterilizer manufacturer's directions for the correct sterilization procedures. Note that ethylene-oxide mixtures, particularly those containing Freon, may cause"crazing" (minute superficial cracking) of plastic parts.

CAUTION: Parts that have been sterilized with ethylene-oxide must be quarantined in a well ventilated area to allow dissipation of residual gasses that have been absorbed by the material. In some cases, quarantine periods of seven days or more may be required. Follow the recommendations of the sterilizer manufacturer for the specific aeration periods required.

CAUTION: Prior to placing the unit back into service, after disassembly or cleaning, perform the checkout procedure.

7/Troubleshooting

1. No regulation
   - Check the Regulator Ass'y
   - Check the selector valve
   - Check the gauge for stuck needle
   - Check for leak
   - Check for blocked Back Plate
2. No gauge reading
   - Check to see that the gauge is operational.
   - Check for leak
   - Check for blocked Back Plate
3. Unit leaks
   - Check for cracks in unit
   - Check for bad O-rings or a leaking component (remember, the unit will leak if the gauge bleed is not blocked during testing)
4. Selector not in proper position
   - Reposition selector
5. Suction tube not in place
   - Refit tube
6. Insufficient vacuum to drive unit
   - Check vacuum supply
7. On-off cycle inhibited by timing valves too tightly adjusted
   - Adjust valves as required
8. O-rings leaking
   - Disassemble for inspection
9. Timing control valves plugged
   - Disassemble for cleaning
10. Flow control valve shut off or plugged
    - Disassemble for cleaning
11. Regulator shut off or plugged
    - Disassemble for cleaning
12. Filters blocked
    - Disassemble for cleaning

8/Repair Procedures

8.1 Repair Guide

1. Back Plate Assembly--any damage or leaks found in the back plate assemblies can be repaired only by replacing the complete back plate assembly.
2. Gauges--incorrect readings due to a consistent error can usually be corrected by removing the gauge and carefully realigning the gauge pointer. For non-linearity, inconsistent readings or incorrect zeroing replace the gauge.
3. Selector Valves--leaks in this area of the unit can be corrected by the replacement of O-rings/gaskets lubricated with Dow Corning No. 111 lubricant. Continued failure in the selector valve area indicates a bad selector switch plate, stem or a bad back plate assembly.
4. Electrical continuity--clean connection hole or replace the spring/wire as required.
5. Inlet/Outlet connection leak--replace the O-ring behind the connection adapter. Be certain to lubricate the new O- ring with Dow Corning No. 111 lubricant. Refit the adapter using Loctite or Teflon tape to produce a seal.

   Loctite #242 medium strength on suction inlets
   Loctite #290 high strength on vacuum outlets
6. Replace front covers, gauge lenses, or knobs as required.
7. If a leak is present after O-ring replacement, a hole in the regulator bellows is indicated and requires regulator replacement. Poor regulation may be cured by cleaning the assembly (valve stems can be carefully removed on some units), but continued problems can be cured by replacement only.
8. Intermittent Mode Problem: If after cleaning filters, timing valves, flow valve settings and O-rings, an intermittent mode fault persists, replace the Unilogic module.

8.2 Repair Kits

Filters for the ISU should be replaced annually or more frequently if required. This ensures uninterrupted service as clogging of the filters will occur over a period of time. A complete kit consisting of the 5 filters can be ordered. This kit (p/n 0221-5884-870) includes the following items:

Filter, Timing	2 each	0221-5883-300
Filter, gauge	1 each	0210-6540-300
Filter,green (Unilogic)	1 each	0221-5879-300
Filter, beige (Unilogic)	1 each	0221-5880-300

If the ISU has been returned to the Bio-medical Engineering Department for service, we recommend replacement of all O-rings. Order O-ring kit #0210-0474-870. This kit includes the following items:

O-Rings, Gauge Stem	2 each	0210-0572-300
O-Ring, Selector Valve	4 each	0210-0687-300
O-Ring, Timing Valve (lg)	2 each	0210-0586-300
O-Ring, Timing Valve (small)	2 each	0210-0559-300
O-Ring, Flow Control Valve	1 each	0210-0700-300
O-Ring, large, Regulator	2 each	0210-0562-300
O-Ring, Regulator stem	1 each	0210-0524-300

Some common replacement parts are also available in quantity for larger scale repair centers:

Gauge assembly (package of 4 each) 0205-8689-870

Regulator assembly (package of 6 each) 0306-1023-870

Selector Knob assembly, instr included.
(package of 6 each) 0221-5852-870

Regulator Control Knob assembly, Instr.
included (package of 6 each) 0221-5853-870

Timing Valve, complete, package of 6 each 0207-8298-870

Replacement Unilogic Module Kit for old 0221-5897-870
style ISU's which have 4 Unilogic Modules. Includes new style module, hardware for mounting on old style base, and instructions.

8.3 Replacement of Old Style Unilogic Modules

Kit #0221-5897-870

1. Remove the three screws from the rear of the unit that hold the base assembly and cover assembly together.

   Note: Do not remove the two screws that hold the inlet connector (metal piece) to the base assembly. This could impair electrical conductivity.

2. Turn the knob marked "REGULATOR" counterclockwise until the cover can be lifted easily from the base assembly.

3. Remove and discard the two timing control valve retainers, the four Unilogic Modules, the three silastic connecting tubes, and the yellow dust cap. **Retain one of the silastic tubes for step six.** (See Figure 14)

4. Take two of the yellow caps found in the kit and cut their lengths to approximately one-half.

   Install five of the caps to the unit's base assembly and one to the new Unilogic module, as shown in Figure 14.

5. The six 5/8 inch long connecting tubes are to be connected to the bottom side of the new Unilogic Module.

6. Push the module in place making sure that all the connecting tubes go over their corresponding studs on the unit's base assembly. Use one length of discarded silastic tubing to connect the Unilogic to the left volume port. Wet the tubes to aid connection.

7. Replace the cover assembly by reversing steps 1 and 2.

CAUTION: When installing the screws into the plastic, use care to get them started straight and use only moderate torque for tightening to prevent stripping the threads.

CAUTION: Prior to placing the unit back into service, after disassembly or cleaning, perform the checkout procedure.

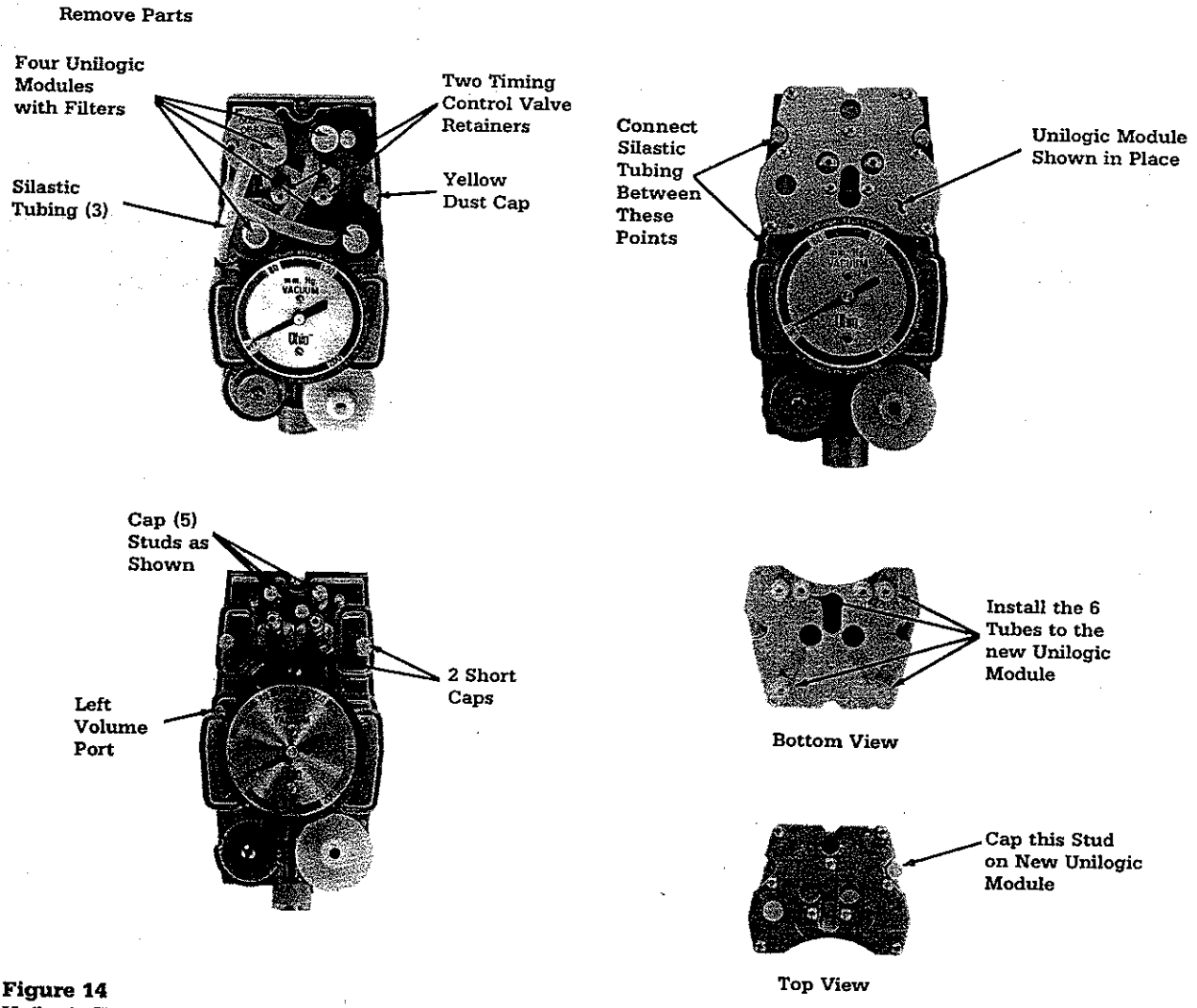


Figure 14
Unilogic Kit

Warranty

This Product is sold by Ohmeda under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this Product directly from Ohmeda or Ohmeda's Authorized Dealers as new merchandise and are extended to the first Buyer thereof, other than for purpose of resale.

For a period of twelve (12) months from the date of original delivery to Buyer or to Buyer's order, but in no event for a period of more than two years from the date of original delivery by Ohmeda to an Ohmeda Authorized Dealer, this Product, other than its expendable parts, is warranted to be free from functional defects in materials and workmanship and to conform to the description of the Product contained in this operation manual and accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use, that regular periodic maintenance and service is performed and that replacements and repairs are made in accordance with the instructions provided. This same warranty is made for a period of thirty (30) days with respect to the expendable parts. The foregoing warranties shall not apply if the Product has been repaired other than by Ohmeda or in accordance with written instructions provided by Ohmeda, or altered by anyone other than Ohmeda, or if the Product has been subject to abuse, misuse, negligence, or accident.

Ohmeda's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at Ohmeda's option, a Product, which is telephonically reported to the nearest Ohmeda Regional Service Office and which, if so advised by Ohmeda, is thereafter returned with a statement of the observed deficiency, not later than seven (7) days after the expiration date of the applicable warranty, to the designated Ohmeda Regional Service Office during normal business hours, transportation charges prepaid, and which, upon Ohmeda's examination, is found not to conform with the above warranties. Ohmeda *shall not be otherwise liable for any damages including but not limited to incidental damages, consequential damages, or special damages.*

There are no express or implied warranties which extend beyond the warranties hereinabove set forth. Ohmeda *makes no warranty of merchantability or fitness for a particular purpose with respect to the product or parts thereof.*

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Essex
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Latin America, Caribbean
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Telex 810 8486057

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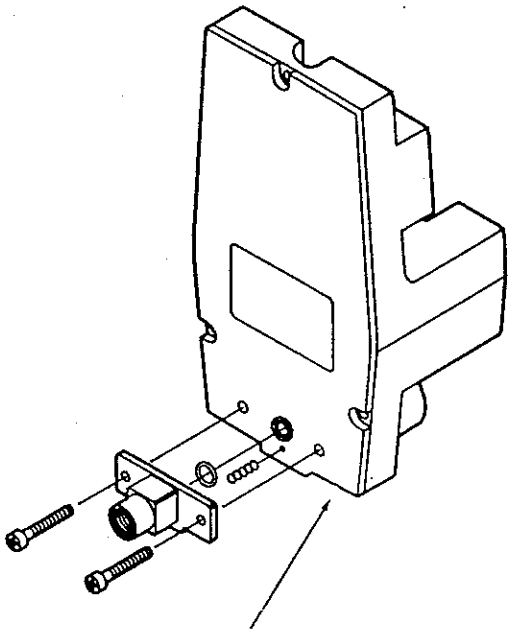
Addendum to the Intermittent Suction Unit

Operation and Maintenance Manual

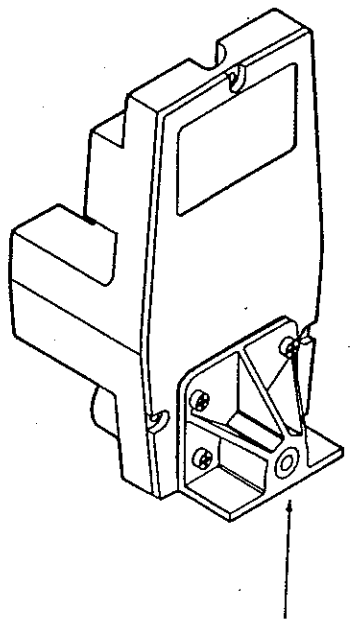
Stock No. 0178-1639-001

Service Manual

Stock No. 6700-0009-000

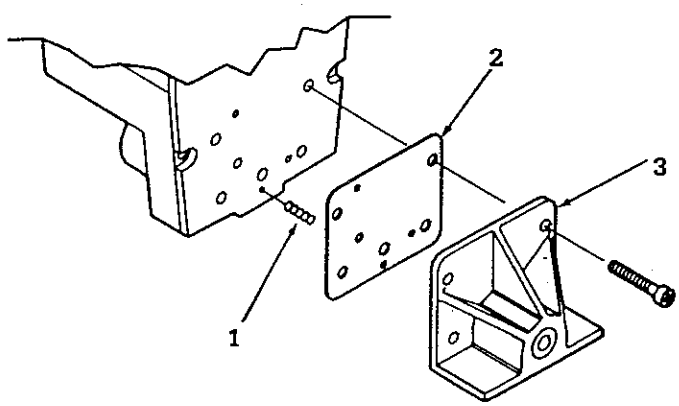


Old Bases (requires metal inlet connector)
P/N 0221-5890-300 (obsolete)
0221-5889-300 (obsolete)



New Base Assembly
P/N 6700-0002-700

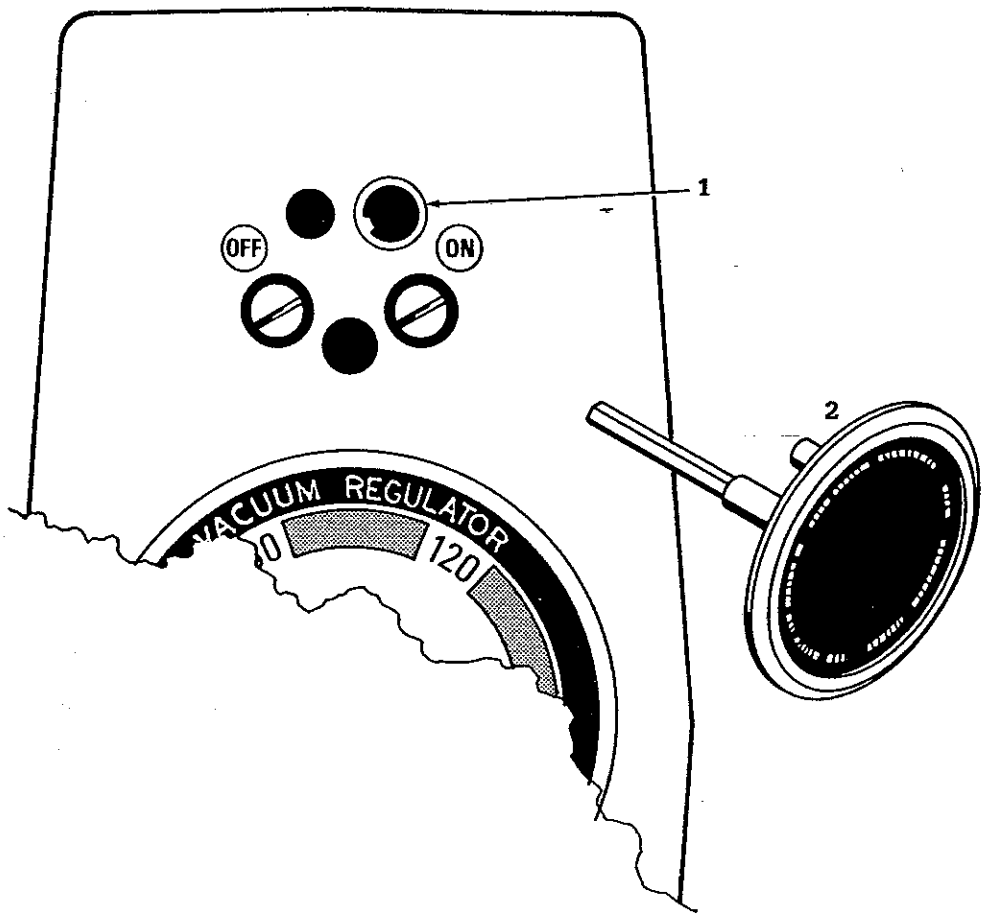
Partial Assembly



Replacement Parts

1. Spring 0203-3003-300
2. Gasket 6700-0300-500
3. Brackt 6700-0053-400

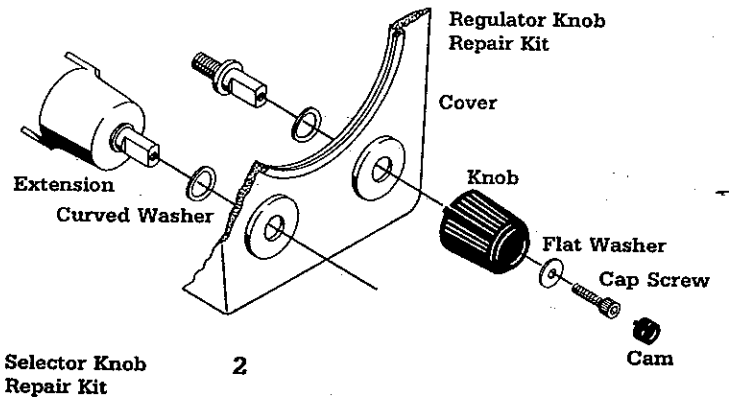
The base (0221-5890-300), for older units (with 4 logic modules), is not available. If this old base is broken, replace with new base assembly (6700-0002-700) and a Unilogic Module Kit (0221-5894-870). The base (0221-5889-300), for use with the metal inlet, connector, is no longer available (although the metal inlet, spring, screws and O-ring are still available as service parts). This base is also replaced with the new base assembly (6700-0002-700).

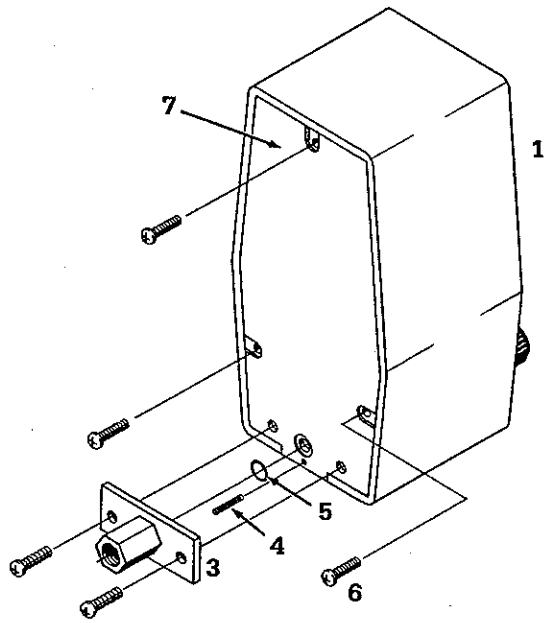


Item	Stock Number
1. Holding Clip	0402-2018-300
2. Key and Label	0212-1706-300

1.06
3.18 ea — 6700 - 0843-100 (4.45)

Figure 15
Time Cycle Adjustments

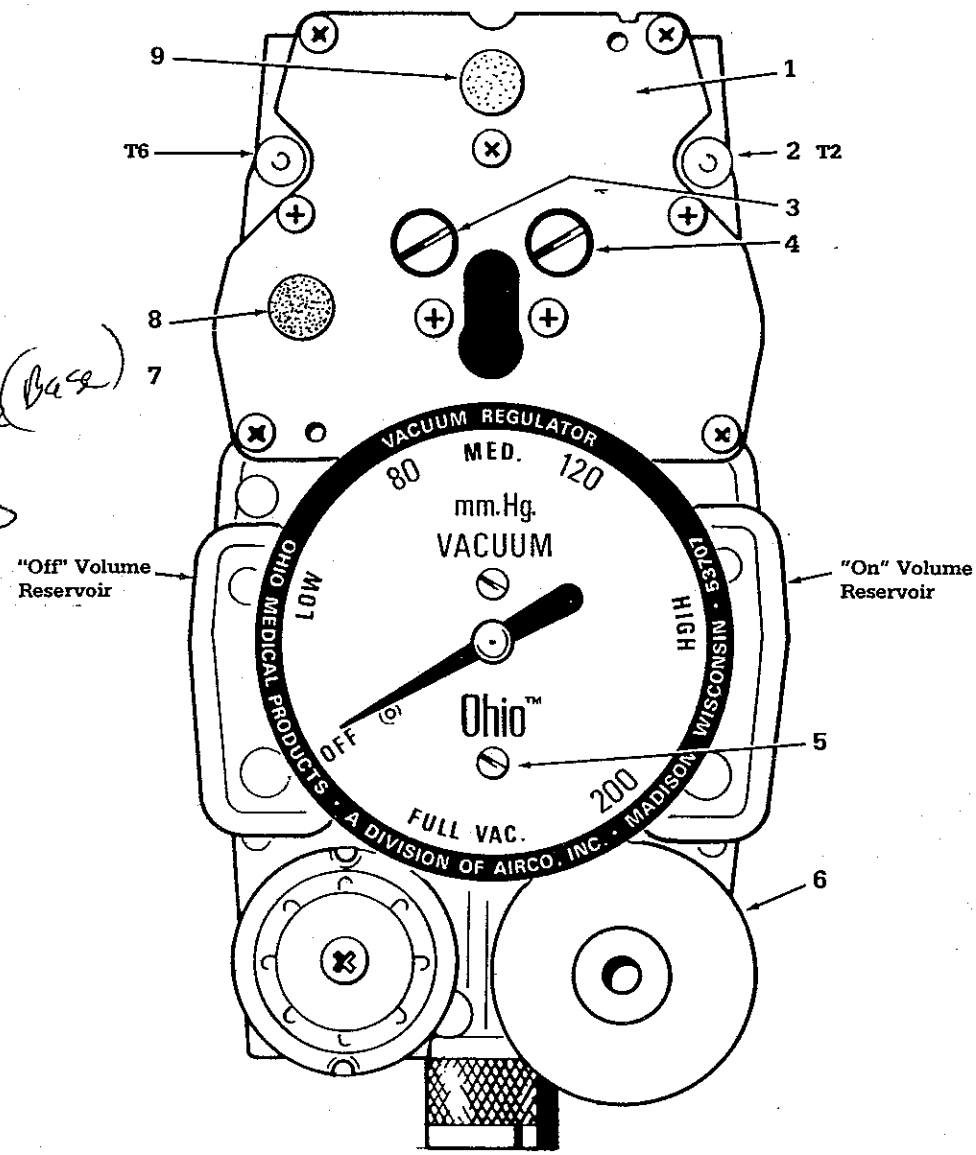




Item	Stock Number
1. Cover and Knob Assembly less gauge lens)	0221-5899-300
Gauge Lens (not shown)	0212-0921-300
2. Selector Knob Repair Kit	0221-5897-300
Regulator Knob Repair Kit	0221-5898-300
3. Inlet Connector	0206-5149-300
4. Spring	0203-3003-300
5. O-Ring	0210-0687-300
6. Screw	0142-4733-114
7. Base*	0221-5889-300

*Note: The base for older units (with 4 logic modules) is not available. If the old style base is broken, replace with new style base (0221-5889-300) and a single Unilogic Module (0207-9603-300).

Figure 16
Back Assembly



Backplate (Base)
5970063
6700-0090-700

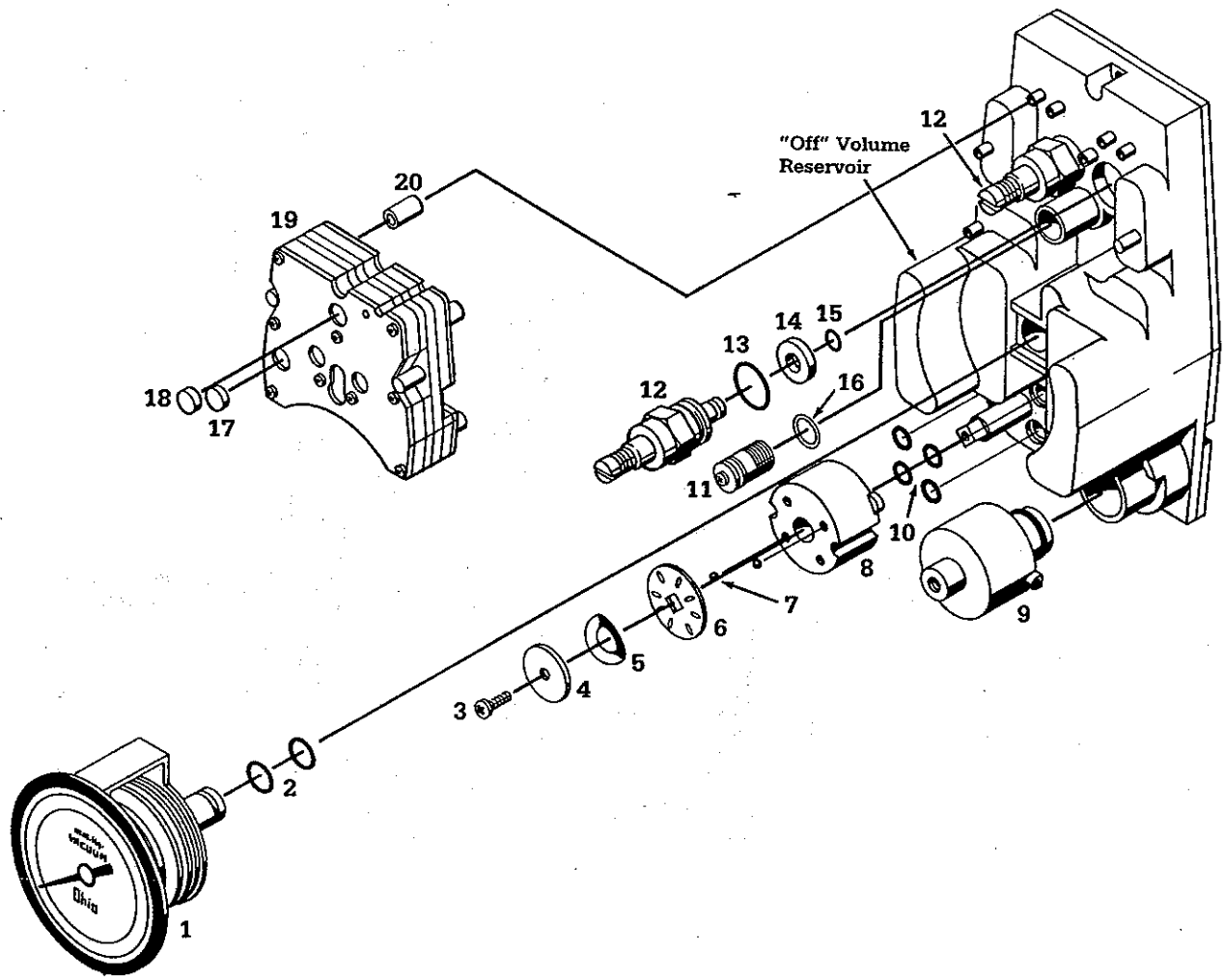
Item		Stock Number
1.	Unilogic Module	0207-9603-300
2.	Dust Cap	0203-0165-300
3&4.	Timing Control Valve	0207-8295-300
5.	Filter	0210-6540-300
6.	Regulator Assembly	0306-1007-300
7.	Flow Control Valve	0207-0132-300
8.	Filter, Green	0221-5879-300
9.	Filter, Beige	0221-5880-300
10.	Connector Tube, 5/8" long (not shown)	0211-0675-300

$1.06 ea
1470105

Note: Old style (4 module) Unilogic Modules are obsolete. Replace with Unilogic Module Replacement Kit: 0221-5897-870.

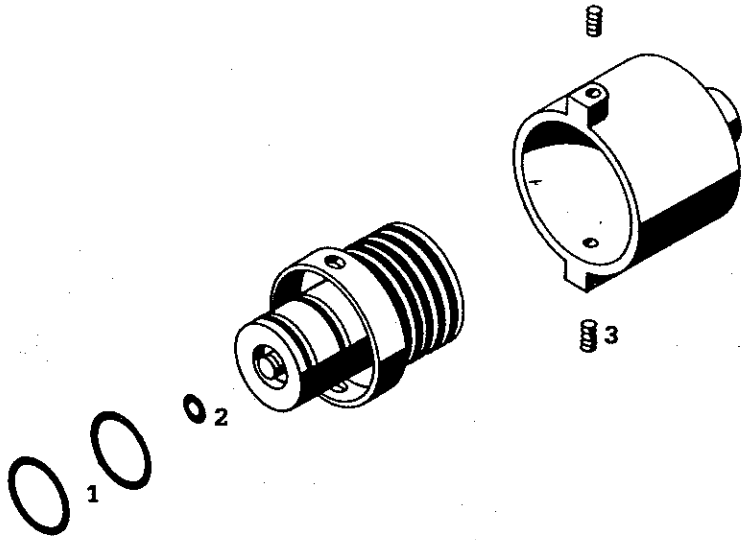
0221-5894-870 $167.48

Figure 17
ISU



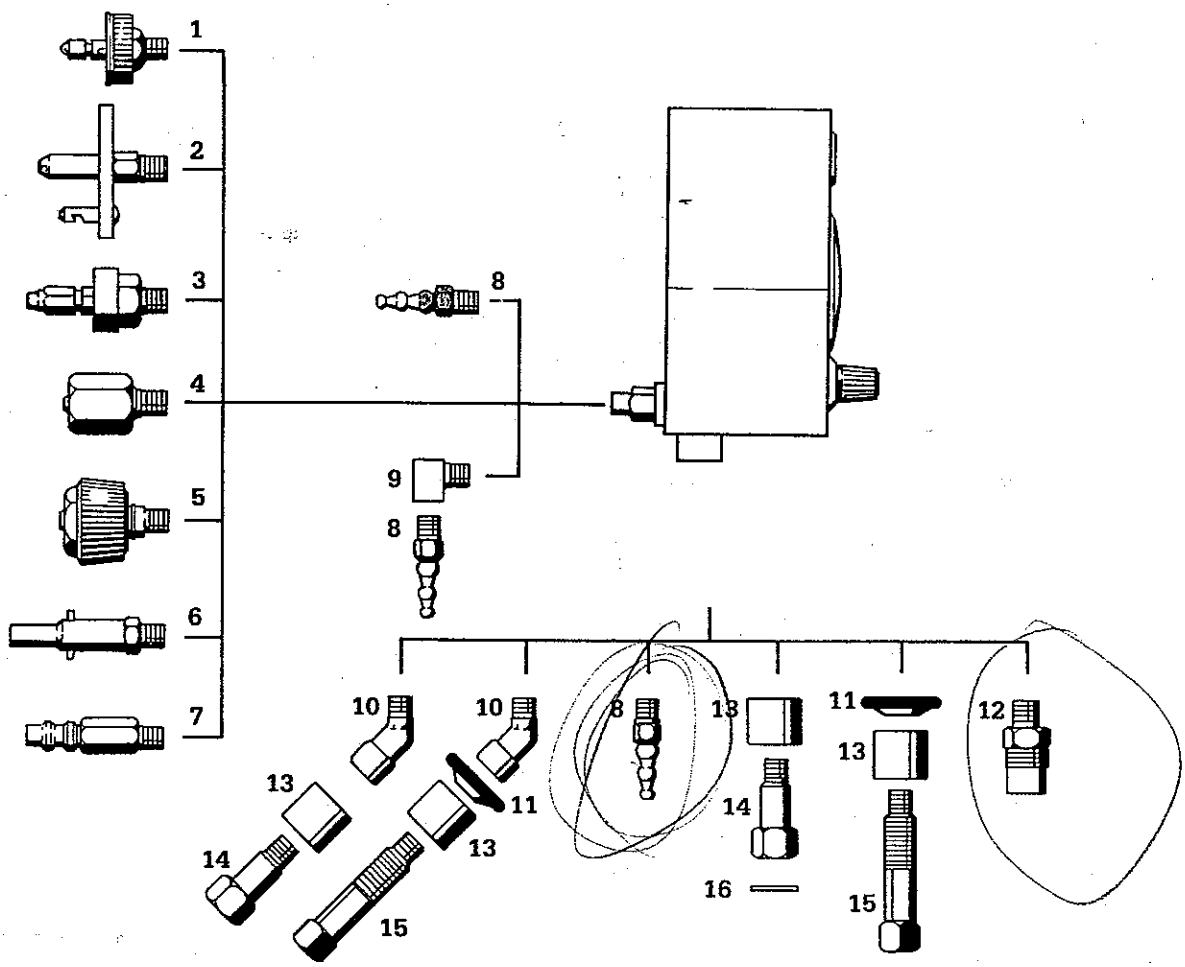
Item		Stock Number
1.	Gauge Assembly w/O-rings	0205-8688-300
	International Gauge Assembly w/O-rings	0205-8695-300
2.	O-Rings (2)	0210-0572-300
3.	Screw, #6 × 1/2"	0142-4833-108
4.	Retaining Washer	0402-0748-300
5.	Spring Washer	0402-0737-300
6.	Detent Plate	0214-3213-300
7.	Ball (4)	0409-1684-300
8.	Valve Body	0221-5891-300
9.	Regulator Assembly (See Figure 19)	0306-1007-300
10.	O-Ring (4)	0210-0687-300
11.	Flow Control Valve	0207-0132-300
12.	Timing Control Valve (2) (See Figure 22)	0207-8295-300
13.	O-Ring (2)	0210-0586-300
14.	Filter, Timing Control Valve (2)	0221-5883-330
15.	O-Ring (2)	0210-0559-300
16.	O-Ring	0210-0700-300
17.	Filter, Green	0221-5879-300
18.	Filter, Beige	0221-5880-300
19.	Unilogic Module	0207-9603-300
20.	Tubing, Length 5/8" (6)	0211-0675-300

Figure 18
ISU Exploded View



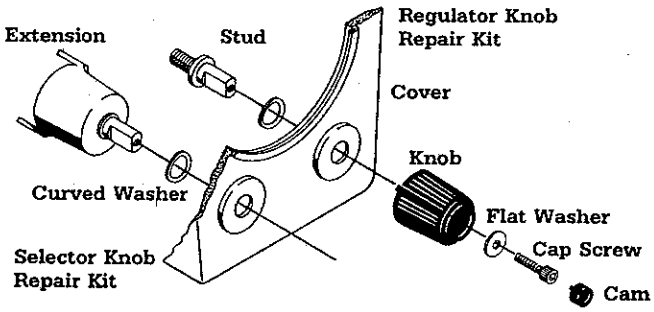
Item	Stock Number
1. O-Ring (2)	0210-0562-300
2. O-Ring	0210-0524-300
3. Set Screw, 6-32 × 1/4" St. St. (2)	0141-4124-108

Figure 19
Regulator Assembly (0306-1007-300)



Item	Stock Number
1. Diamond Outlet Adapter, Vac	0221-2685-802
2. NCG Adapter (round), Vac	0221-0204-802
NCG Adapter (rectangular), Vac	0221-0205-800
3. Schrader Adapter, Vac	0221-0690-731
4. DISS Union Nut, Vac	0204-6602-535
DISS Union Gland, Vac	0204-7979-535
5. DISS Hand-I-Twist Nut and Gland, Vac	0204-6717-800
DISS Hand-I-Twist Nut, Vac	0204-6702-700
DISS Union Gland w/O-Ring Groove	0204-7993-535
O-Ring	0210-0700-300
6. OES Adapter, Vac	0221-0152-300
7. Buritan Adapter, Vac	0221-0106-300
8. Nipple, tubing	0204-9020-535
9. Street Ell, 90	0213-4005-335
10. Street Ell, 45	0213-6126-330
11. Nut, Lock	0221-5734-535
12. Vacuum DISS, male	0204-7989-535
13. Sleeve, Locking	0221-6260-300
14. Adapter Fitting	0221-6262-300
15. Adapter Fitting, Threaded for Suction Reg.	0221-6263-300
16. O-ring for item 14 or 15	0210-0568-300

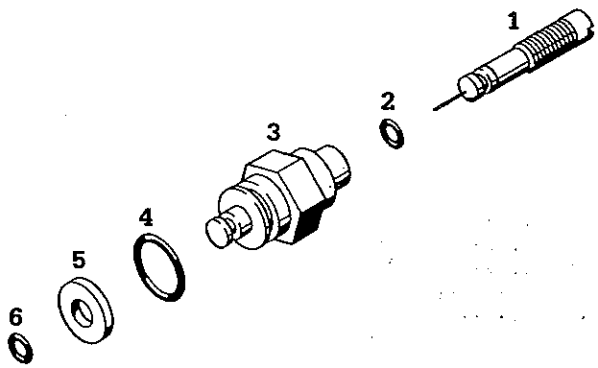
Figure 20
Fittings for ISU



The repair kits consist of the following parts which can be ordered individually.

	Selector Knob Repair Kit 0221-5897-300	Regulator Knob Repair Kit 0221-5898-300
Knob	0212-1914-300	0212-1914-300
Washer, Spring	0402-0736-300	0402-0736-300
Flat Washer	0202-4508-300	0202-4508-300
Cap Screw	0144-2117-206	0144-2117-206
Cam	0212-1705-300	0212-1705-300
Stud	-	0221-5876-300
Extension	0212-1700-300	-

Figure 21
ISU Selector Knob and Regulator Knob Repair Kits



Item	Stock Number
Timing Valve (New Style)	0207-8295-300
1. Needle and Shank Assembly	0207-8293-300
2. O-Ring	0210-0559-300
3. Valve Base	0207-8289-300
4. O-Ring	0210-0586-300
5. Filter	0221-5883-300
6. O-Ring	0210-0559-300

Note: The new style valve is a direct replacement for the old style. The ISU has two identical timing valves: one for ON time and one for OFF time.

Figure 22
ISU Timing Valves

Ohmeda

Ohmeda
9065 Guilford Road
Columbia MD 21046 1801 USA
301 381 2555
Cable Address OHMEDA
International Telex 023 497 2197
Technical Support 800 345 2700

A Division of The BOC Group Inc

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Eastern Region
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Fort Lee NJ 07024
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201 947 6100 In NJ

Midwestern Region
1801 W 16th St
Broadview IL 60153
800 372 5867

Pacific Region
Suite 406 5635 W Las Positas Blvd
Pleasanton CA 94577
800 227 2054 Outside CA
800 772 3517 In CA

Southeastern Region
4565 Winters Chapel Rd
Atlanta GA 30360
800 241 4300 Outside GA
404 449 7990 In GA

Southwestern Region
324 Exchange Drive
Arlington TX 76011
800 433 5070 Outside TX
800 772 5420 In TX

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Essex CM19 5AB England
Telex 817566

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Miami FL 33176
Telex 810 8486057

Southeast Asia
#06 01 Eng Cheong Tower
5611 N Bridge Road
Singapore 0719
Telex RS35276

Middle East, Nigeria
Elizabeth Way
Harlow Essex
CM19 5 AB England
Telex 817566

National Service Center
Ohmeda
4507 C Mills Place
Atlanta GA 30336
800 241 6442
404 691 3635

Canada
Service Centre
172 Belfield Road
Rexdale Ontario M9W 1H1
416 243 9533
Telex 06989362

6700 0009 000
11 86 0 20 12 08
Printed in USA

BOC Health Care

Fittings and Adapters

Quick Connect Adapters

Ohmeda Diamond, High Flow, Safety Keyed, Color-Coded, Nonswivel Adapters

※ Diamond Adapter with ⅛" NPT male

6700-0300-800	O_2	(Green)
6700-0300-801	N_2O	(Blue)
6700-0300-802	Vac	(White)
6700-0300-803	Air	(Yellow)
6700-0300-804	CO_2	(Gray)
6700-0300-805	Evac	(Black)
6700-0299-805	Evac	(Violet)

※ Diamond Adapter with DISS male

6700-0302-800	O_2	(Green)
6700-0302-801	N_2O	(Blue)
6700-0302-802	Vac	(White)
6700-0302-803	Air	(Yellow)

※ Diamond Adapter with DISS union nut

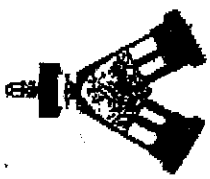
6700-0304-800 O_2 (Green)

※ Diamond Adapter with ⅛" NPT female

6700-0303-800	O_2	(Green)
6700-0303-801	N_2O	(Blue)
6700-0303-802	Vac	(White)
6700-0303-803	Air	(Yellow)
6700-0303-804	CO_2	(Gray)

※ Diamond Adapter extension with ⅛" NPT male for flowmeter

6700-0301-800	O_2	(Green)
6700-0301-803	Air	(Yellow)



Diamond Duplex Adapter, Diamond Male and 2 Diamond female checks

0221-0453-800	O_2	(Green)
0221-0453-801	N_2O	(Blue)
0221-0453-802	Vac	(White)
0221-0453-803	Air	(Yellow)

※ Diamond 90° Adapter for ceiling column

0221-0472-800	O_2	(Green)
0221-0472-801	Vac	(White)

※ Diamond Adapter with hose barb for ¼" I.D hose.

6700-0305-800	O_2	(Green)
6700-0305-801	N_2O	(Blue)
6700-0305-802	Vac	(White)
6700-0305-803	Air	(Yellow)
6700-0305-804	CO_2	(Gray)
6700-0305-805	Evac	(Black)

※ Kit with Two Ferrules

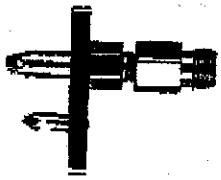
0221-1001-880	
0221-1001-881	
0221-1001-882	
0221-1001-883	
0221-1001-884	
0221-1001-885	

Chemetron (NCG) Adapters

※ Chemetron Adapter with ⅛" NPT male

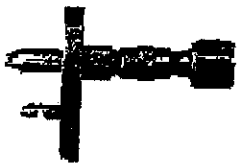
NO RECTANGULAR

6700-0500-800	O_2	(Round)	(Green)
6700-0500-801	N_2O	(Round)	(Blue)
6700-0500-802	Vac	(Rectangle)	(White)
6700-0505-802	Vac	(Round)	(White)
6700-0500-803	Air	(Rectangle)	(Yellow)
6700-0505-803	Air	(Round)	(Yellow)



※ Chemetron Adapter with DISS male

6700-0501-800 O_2 (Round) (Green)

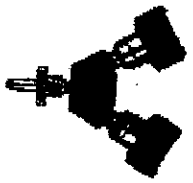


※ Chemetron Adapter with DISS female union nut

6700-0502-800 O_2 (Round) (Green)

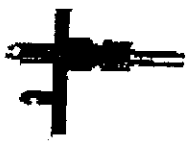
※ Chemetron Adapter with ⅛" NPT female

6700-0503-800	O_2	(Round)	(Green)
6700-0503-802	Vac	(Rectangle)	(White)
6700-0505-802	Vac	(Round)	(White)



※ Chemetron Duplex Adapter, NCG male and 2 NCG female checks

6700-0509-800	O_2	(Round)	(Green)
6700-0509-802	Vac	(Rectangle)	(White)
6700-0509-803	Air	(Rectangle)	(Yellow)



※ NCG Adapter with hose barb for ¼" I.D hose.

※ Kit with Two Ferrules

0221-0200-800	O_2 (Round)	0221-1006-880
0221-0200-801	N_2O (Round)	0221-1006-881
0221-0201-800	Vac (Rectangle)	0221-1006-882
0221-0200-802	Vac (Round)	N/A
0221-0201-801	Air (Rectangle)	0221-1006-883
0221-0200-803	Air (Round)	N/A

※ These models contain no ferrous metal that is magnetically attractive